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AMERICAN CONGRESS ON SURVEYING AND MAPPING
Box 470, Benjamin Franklin Station
WASHINGTON 4, D. C.

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A Message to the Members

GEORGE D. WHITMORE, President

IT IS CUSTOMARY for your officers, once each year, to report to the membership on the condition of the Congress, the trends, and the plans for the next year. Looking back over the past year, there can be no doubt that the Congress is moving forward, and probably at an accelerating rate. We are all entitled to feel encouraged, but not in any sense satisfied. We can, and will, move forward at an even faster rate during the coming year, assuming always the same fine cooperation from other officers, and increasing activity on the part of the membership body. A notable cause of this sense of encouragement is the obvious growing interest and enthusiasm on the part of the general membership, and particularly among other officers and committeemen. This increasing interest was especially manifested at the Fourth Annual Meeting in Washington on June 3; but it was also plainly indicated during the year in committee meetings, and in the increasing correspondence with members and field officers.

We are all entitled to feel greatly pleased in regard to our quarterly publication, "Surveying and Mapping," which in the course of a year has been constantly improved and enlarged with each issue, and is now well on its way to becoming the recognized journal of the surveying and mapping profession. For this major accomplishment, all credit is due Editor A. L. Shalowitz, who has given unstintingly his own time and effort to bring about these improvements. But none of us should feel satisfied yet about the publication. It should be larger, be published more often, carry more original papers prepared by our own members, and become partly self-financing through advertising. These aims for the publication will inevitably come about as we grow in membership.

Another of the officers who has given freely of his time and effort and has kept the wheels of the organization turning is the Secretary-Treasurer, Major Richard T. Evans.

Also on the favorable side, it may be said that the 1944 Annual Meeting was in almost every respect the best meeting thus far, due in large part to

the efforts of the able Chairman of the Committee on Arrangements, Mr. M. Y. Poling. The papers were all interesting and timely, the authors were authorities, the attendance was the largest yet, and a general attitude of high enthusiasm prevailed. In postwar years these meetings should be of more than 1 day's duration to allow ample time for discussion of papers, for meetings of the Technical Divisions, and for business sessions.

Other encouraging developments include the formation of a Technical Division on Property Surveys; the revival of interest in the five other Technical Divisions; the affiliation of seven nationally known firms, two of which signed for four Commercial Institutional Memberships; the inclusion of several prominent new members from Canada and South American republics; and the beginning of efforts toward formulating postwar surveying and mapping programs.

As to the immediate future, we need to become much more active in organizing local sections and technical divisions; in formulating definite, year-by-year programs for improvement of the profession; in adopting clear-cut policies as to the functions of the Congress, in such matters as surveying training in the colleges; and last, but very important, we need to become aggressive in soliciting new members.

For obvious reasons, we should double, treble, or even quadruple our present membership. This is judged to be not too difficult to attain if every member will consider it his first obligation to the Congress to obtain at least one new member in the immediate future. This can be accomplished through personal contacts with professional friends and acquaintances, and through the widest possible distribution of our publication, "Surveying and Mapping." As the aims and purposes of the Congress become better and more widely known, there is every reason to expect that a substantial part of all surveying and mapping careerists, of all branches of the profession, will want to be members.

●

ART TREASURES MAY BE SAVED THROUGH MAPS

A GROUP OF ART EXPERTS working in a quiet little map-strewn room in New York are mapping for the invading air corps and other military units the exact geographical position of every European museum, library, and historical or religious monument.

This Committee for the Protection of Cultural Treasures in War Areas started work in the Frick Art Reference Library the day Sicily was invaded. Since then an eight-man staff, aided by volunteers, operating on a Rockefeller grant, has produced more than 500 carefully detailed maps. When the last map is finished, the Committee will continue keeping detailed files on looted treasures; after the war, this material will be used to restore the right paintings to the right museums.

—*The Washington Post*, May 28, 1944.

The Fourth Annual Meeting

NOTE:—It is proposed to publish in the next issue of SURVEYING AND MAPPING all the papers (including the discussions) presented at the Fourth Annual Meeting. Only brief mention is therefore being made of them here. —EDITOR.

THE FOURTH ANNUAL MEETING of the American Congress of Surveying and Mapping was held at Washington, D. C., on June 3, 1944, in the Federal Room of the Hotel Statler. There was a registered attendance of 146; but the cumulative attendance during the various sessions approximated 300, the largest that ever attended any meeting of the Congress.

Considering the many difficulties surrounding wartime, it was gratifying to the Committee on Arrangements to see so large a turn-out of local and out-of-town members and guests. This manifestation of interest on the part of representatives of the surveying and mapping profession would seem to augur well for the future of the Congress.

In general, the theme of the meeting was Planning for Postwar Activities and included recognition of the developments brought about by the war and their value to peacetime operation. Prepared papers were presented by prominent authorities in the fields of education, geodetic control, cartography, urban and metropolitan surveys, state planning, and private practice.

MORNING SESSION

The Congress was officially opened by President Whitmore at 9:45 A.M. After a brief statement relative to the Fourth Annual Meeting, he appointed Mr. Virgil Kauffman to head the Tellers Committee and Mr. R. M. Wilson to head a Committee on Resolutions. Mr. Whitmore then introduced Rear Admiral L. O. Colbert, Director of the U. S. Coast and Geodetic Survey, to preside during the presentation of the technical papers.

The papers at the morning session covered two aspects of surveying and mapping, namely: "Education and Training for Surveying and Mapping After the War," presented by Professor Zelner of the University of Minnesota and Professor Rayner of the University of Illinois; and "Geodetic Control for Other Than Mapping Purposes," presented by Mr. Carroll F. Merriam of the Pennsylvania Water and Power Company and Mr. Joseph M. Dearborn, Director of the Bridgeport Geodetic Survey.

PROFESSOR ZELNER discussed primarily "what shall we teach" including trends

and needs in the postwar period. He gave the results of an extensive poll which he conducted on this question among various groups and individuals in government, industry, universities, and colleges, and practicing engineers and surveyors. The poll revealed a wide variance in the opinions registered.

PROFESSOR RAYNER discussed the problem of "how shall we teach." He said it was not likely that the new conditions will require many changes in the present methods, but there may be a greater use of visual aids by demonstration and motion pictures, which are now so widely used by the armed forces. He also mentioned that in a recent study of engineering curricula by a distinguished committee, a group of humanistic-social studies was recommended to be given in parallel with technical subjects.

MR. MERRIAM presented interesting information on the use of geodetic control for the general welfare of a community and described activities undertaken in Maryland with respect to public safety, civilian defense, and the work of the public utility companies. He said that the potentialities of the State Plane Coordinate System for effecting economies in surveying and mapping and in the simplification of land referencing are enormous.

MR. DEARBORN discussed the value of control surveys in an urban area in connection with the proper functioning of the various municipal departments. He emphasized that if engineers, laymen, and disbursing authorities in our American cities were sufficiently informed as to the value and permanency of the precise control survey as a solution of their problems, there is no question but what great advancements would be made in municipal survey procedure and accuracy.

Under the guise of a talk by President Whitmore on "The Sound and Fury," it was disclosed that this was really a business session of the Congress. Secretary Evans presented a brief report on the activities of the Congress for the past year and submitted a Treasurer's report for the same period. (These reports are printed under "Congress News.")

Commander Borden, the chairman of the newly created Committee on Publications, reported that his committee has barely gotten underway. He said there should be no dearth of publication material, but thought the big job would be to balance off the material submitted. He also emphasized that the Congress had an opportunity, through its official publication, to build a powerful and influential organization that can make itself felt among those inclined to belittle surveying and mapping.

Mr. S. A. Bauer, the chairman of a pro tem committee to conduct a poll among the membership on the extent of interest in a Technical Division on Land Surveying, reported on the work of his committee. (The results of the poll, the Resolution adopted by the Congress, and other matters relating to this new Technical Division are included under "Congress News.")

Afternoon Session

Dr. W. E. Wrather, Director of the U. S. Geological Survey, presided

at the afternoon session. The papers presented included four major topics, namely: "Surveying and Mapping Activities in the Americas," presented by Engenheiro, Leite de Castro of Brazil, Mr. F. H. Peters, Surveyor General of Canada, and Lt. Colonel Gerald FitzGerald of the U. S. Army Air Forces; "Programming Surveys and Mapping in Urban and Metropolitan Areas," presented by Mr. H. H. Kranz, City Engineer of Cincinnati, Ohio, and Lt. Colonel Arthur J. Sweet of the U. S. Army; "Surveys and Maps in State Planning," presented by Miss Elisabeth M. Herlihy, Chairman of the Massachusetts State Planning Board; and "Expanding the Field for the Practicing Surveyor," presented by Mr. Michael Baker, Jr. of the Baker Engineers.

Dr. Jorge Zarur, now on special assignment in this country for the Brazilian Government, introduced Dr. Leite de Castro whom he praised for his work as Director of the National Council of Geography of Brazil.

DR. LEITE DE CASTRO spoke primarily on cartographic activities in Brazil. He stressed the need for an interchange of ideas and opinions with respect to cartographic methods and techniques in order to attain a higher degree of standardization throughout the Western Hemisphere. He discussed the importance of the Second Consultation on Cartography to be held in Rio de Janeiro in August.

MR. F. H. PETERS stated that Canada has recognized the value of surveying and mapping operations for many years, and this recognition has been crystalized in the teaching of surveying procedures and by the activities of the professional societies and practitioners. He said that Canada feels that, with an interchange of ideas on the problems and accomplishments in the surveying and mapping field, the growth and influence of the profession in the Western Hemisphere is assured.

LT. COLONEL GERALD FITZGERALD stated that domestic postwar mapping will require aerial photography and modern photogrammetric methods if the job is to be completed within the next 25 years. He felt that consideration should be given to the use of military photographic aviation for the purpose. Continual operational training in peacetime is necessary, he believes, if Air Forces units are to maintain the high standard of equipment and personnel developed during the past 2 years.

MR. H. H. KRANZ was unable to attend the meeting and his paper was read by Lieut. Commander Paul A. Smith. Mr. Kranz gave an account of the history of special surveying and mapping activities in Cincinnati, and discussed the difficulties encountered in obtaining funds to carry on such work. He stated that the value of accurate surveying and mapping is the least appreciated of all the activities of a City Engineer's office. He outlined the half-million dollar postwar surveying and mapping project proposed for the City of Cincinnati.

LT. COLONEL ARTHUR J. SWEET emphasized the importance of first-order control surveys and large-scale topographic mapping as a basis for efficient planning and operation in urban and metropolitan areas. He outlined the sequence of surveying and mapping operations with reference to the Cleveland Regional Geodetic and Underground Surveys of Cuyahoga County, Ohio.

MISS ELISABETH M. HERLIHY, the first woman to appear on a Congress program, glamorized surveying and mapping. She covered the broad field of state planning and pointed out specific cases with respect to the importance of surveying and

mapping information. She won the attention and hearty applause of all those present, and even the "hardboiled" engineers and surveyors were made to realize that woman's place transcends the boundaries of the home.

MR. MICHAEL BAKER, JR. described how his concern met the vast, emergency surveying program of the Government since Pearl Harbor. He expressed apprehension over the fate of the private practitioner in the postwar period. It was his opinion that the American Congress on Surveying and Mapping should endorse a recommendation that would give private enterprise a fair chance to participate in whatever the Government's program is for surveying and mapping.

At the conclusion of the technical papers, a brief business session was held. Mr. Virgil Kauffman reported that the Tellers Committee had counted the ballots all of which were cast for President Whitmore. Accordingly, Mr. Whitmore was declared unanimously elected President of the American Congress on Surveying and Mapping for the ensuing year. Mr. R. H. Wilson then presented a Resolution on the creation of a Technical Division on Property Surveys. This was unanimously adopted.

President Whitmore then thanked the Committee on Arrangements, as well as others who assisted the Committee, for making the meeting so outstanding a success, and closed the meeting with the following remark: "We are going to have just as good a meeting next year or perhaps better, so all plan to return and bring your friends."

Evening Dinner

In the evening, an informal dinner was held in the Federal Room of the Hotel Statler and was attended by 141 members and guests. The highlight of the evening was an illustrated talk on the "Third Ascent of Mt. McKinley, Alaska," by Mr. H. Bradford Washburn, Jr., Director of the New England Museum of Natural History. (Mr. Washburn is now on special assignment with the Army Air Forces.) He was introduced to the guests by Rear Admiral L. O. Colbert. Mr. Washburn exhibited high-altitude garments and equipment which were tested on North America's highest peak. His talk was enthusiastically received. Professional photographers who attended the dinner stated that the movies and slides were outstanding and a first class example of colored art in this science.

Guests and members attending the dinner were highly appreciative of the favors given to them through the courtesy of the National Geographic Society. These included two maps—one of the world and one of Germany and the adjacent countries. President Whitmore, on behalf of the American Congress on Surveying and Mapping expressed his sincere thanks to Dr. Gilbert Grosvenor and officers of the Society for this courtesy and for their interest in the affairs of the Congress.

MURRAY Y. POLING

Planetable Versus Transit for Topographic Mapping*

M. F. DENAULT†

SINCE engineers are characterized by their broad-mindedness concerning new developments in their own particular field, it is difficult to understand the profound prejudice against the use of the planetable for its primary function of making topographic maps.

This prejudice exists among a large percentage of engineers engaged in various surveying capacities and is not confined to any particular group. It exists in small local survey outfits, the public utility group, state and municipal survey organizations, and the larger, older, and better organized surveying companies. To those who use and advocate the planetable method, topographic mapping done by transit seems ridiculous. But there are two sides to the question and both should be evaluated.

First consider the reasons attributed to this prejudice. With the smaller groups the cause is mostly ignorance of the existence, strange though it may seem, of the alidade and the planetable or, if known, of their function. Naturally this condition is not found among the larger surveying companies; instead a definite reluctance to depart from the old method of doing topographic mapping by means of the transit is revealed. And what is more, no desire is shown to give the planetable an opportunity to prove itself.

It is only fair to mention that public utility groups are generally more progressive; but, as is the case with most public function groups, they are inclined to observe old methods and to require more detail than seems necessary. This attitude eliminates the planetable as a valuable instrument for certain tasks, as its very simplicity does not conform to the methods prevalent and long established. But the purpose of the topographic map should be understood in order to properly evaluate the conditions under which it can best be made.

Purpose of Topographic Maps

Speaking generally, the purpose of such a map is to act as a guide or chart upon which culture, detail, and topography are shown, enabling accurate planning of highways, railroads, sewer and water systems, airport and dam construction, geologic exploration, forestry, and modern warfare. Therefore, topographic maps are used primarily for planning and esti-

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† Engineer, W. N. Brown, Inc., Washington, D. C.

mating. The technical or instrumental accuracy should be commensurate with the needs of the map, as each use requires its own degree of accuracy and detail.

The three transit methods in current use for topographic mapping are:

(1) A convenient base line is laid out and at constant intervals, depending upon the desired scale and contour interval, lines at right angles to the base line are projected. Along these lines stakes are set at the desired intervals and the ground elevation at these points determined, intermediate elevations being taken at changes of slope. When the lines are drawn and the data plotted on the map sheet in the office, the contours may be interpolated.

(2) Random transit lines are run through the area to be mapped, the positions computed, then plotted on the map sheet. From these and supplementary positions, an azimuth, the stadia distance, and elevation of desired points are determined. These data are recorded in a field book, which is taken to the office, where the data are plotted on the map sheet by a topographic draftsman. All contours, culture, and detail are sketched in the *office*.

(3) The Baltimore or Shirley method, which was first employed on a City of Baltimore survey in 1894-1895. This method, used mostly in the Baltimore region, differs from the second procedure only in the fact that the draftsman accompanies the survey party, plotting and sketching in the field as the work progresses.

The Baltimore method more nearly approaches planetable work, but is not in general use. The first method, though used widely, offers the least advantage of the three methods, due to the great amount of work required in lining and setting stakes and the heavy cutting necessary in wooded country. Therefore, for the purposes of this discussion, the second method, which is that most commonly used, will be the one considered to compete with planetable work.

Planetable for Triangulation

The planetable and alidade were first developed as a means of doing graphic triangulation, for which they are unsurpassed. Success in this work led to their eventual use in the making of topographic maps, using for orientation the methods developed for triangulation.

Methods of orienting the planetable are as follows: (1) The foresight and backsight method, the strongest and the one used where a compass is of no value due to magnetic attraction; (2) the resection method; (3) the three-point triangulation method; (4) the Baldwin solar chart designed

for use where the compass is of no value; and (5) the much-used compass needle orientation.

These methods have all been adapted for use on small and medium scales. On large scales, the foresight and backsight, the resection, and the compass needle methods are most satisfactory. These methods of orientation give many advantages not possessed by the transit. For example, the three-point method would be impossible without the complicated three-point computations.

The modern telescopic alidade, which has internal focusing action, accurate cross hairs, and a powerful lens, is a precision instrument designed and manufactured especially for use in making reconnaissance and topographic surveys with the planetable. Since all horizontal distances are measured by stadia, the alidade has been designed with this factor in mind.

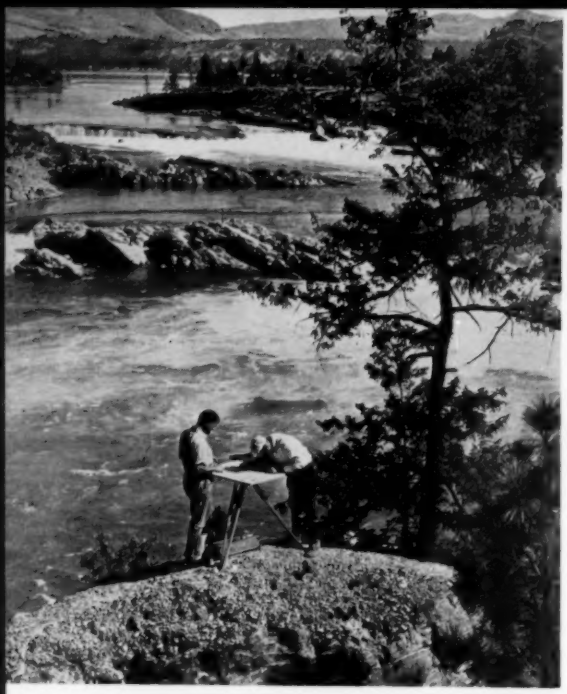
Results in the field prove the importance of this consideration, as the abilities of the alidade have reached a high point. One of its greatest assets is the Beaman arc, which breaks down the trigonometric equation of solving for the vertical correction into a few simple arithmetic steps, and eliminates reading vertical angles and the use of a correction slide rule. Furthermore, the alidade is light, easily carried in the crook of one arm, extremely durable, and quickly adjusted.

Some engineers contend that the planetable is not as accurate in determining the "turns" or supplementary control positions as is the transit. This is based on the fact that with the transit an accurate angle is determined from one turn to the other, thus enabling a better determination of position, whereas with the planetable position is determined graphically. The only other factors of note against the use of the planetable is that the field notes are worthless for reference once the topography is done, and that the positions cannot be checked by another worker. This reason involves several factors that shall be explained in their turn. Finally, there is also the claim that the transit is faster, since more "shots" can be taken in a given time. This view also demands an explanation.

Comparison of Two Methods

Let us break down the mechanical or technical operation of both methods, comparing one against the other and bringing into the discussion the factors noted above: First, the question of determining the supplementary control. While an angle "doubled" to a point is more accurate *in itself* than an alidade sight drawn on the sheet, it is another matter to transmit that accuracy to the map sheet.

In the transit method, a 360-degree protractor is fastened securely to the sheet with its center corresponding to the transit-traverse station at which the transit was set up, and with its north-south axis parallel to that



The peculiar advantages of a planetable are most apparent in mapping rough country. The planetabler maps as he surveys.

of the grid laid out upon the map sheet. By means of a scale, reading left and right from the center, and pivoted upon the plotted position of the traverse station, the azimuth, as taken from the field book, is plotted by means of the protractor and a line drawn. Then the stadia distance is plotted along that line.

The crux of this work lies in the accuracy of transmitting the transit angle reading to the map sheet. Great care must be used in placing the protractor in the correct position, and unless securely placed, it is liable to slippage and consequent error. The protractor in most common use is only calibrated to 15′, which means that the topographer or draftsman can interpolate to the nearest 5′ at best.

With the planetable, the map sheet is attached to the table. On the sheet are the plotted positions of the transit-traverse stations. The original orientation is determined by setting up over a traverse station, placing the straightedge base of the alidade, which is parallel to the telescope's line of sight, on the plotted position of the station at which the table is set up and on that at which the backsight is planned. This work establishes a graphic line of sight relative to that of the two stations on the ground. The table is pivoted until the vertical cross hair of the alidade bisects the rod on the backsight traverse station, then locked in position. This work puts the map sheet in orientation the same as a transit would be after backsighting on the traverse station and locking the bottom plate.

This operation with the planetable accomplishes in several easy steps, the same results obtained in setting up and orienting the transit and going through the necessarily detailed motions of properly securing the protractor in position on the map sheet. Furthermore, the worker using the

planetable has the added advantage of being able to backsight on any visible station plotted on its sheet. The longer the sight the stronger the orientation, which holds true in using the transit. The stadia distance is read to the point desired, and the base of the alidade is brought to the plotted position of the control point and pivoted about this point until the rod is bisected by the vertical cross hair of the telescope. Finally, the line of sight is drawn along the alidade straightedge and the stadia distance plotted along this line. Thus, this method has the accuracy obtained by the transit without the loss of accuracy in its transmission to the map sheet with the protractor. This fact should be considered an important difference.

Advantages of Transit Questioned

The claim that planetable notes are worthless for checking, because of their lack of recorded direction, can be offset against the fact that the azimuth reading to "shots" is not "doubled." Any error resulting from an incorrect azimuth or line of sight can only be corrected in the field by physical comparison of the feature against the graphic position on the map sheet. The planetable topographer readily notices such an error. This statement also applies to vertical distances. By the planetable method evaluation of horizontal angles is unnecessary, as the rod or object is sighted through the telescope and directly aligned in the field.

Another claimed advantage for field notes obtained by the transit is that the topography may be plotted on different scales in the office. The worth of this claim is questionable, however, as the map scale of an area to be mapped is the most important factor to be decided and should be carefully selected before the field work is started. The number of field shots to be taken should have a direct ratio to the map scale, making it unlikely that the notes should ever be used to produce a map plotted on a larger scale. Should the reproduction of a map at a different scale be desired when he planetable method is used, it may be done by photography or if the area is small, by a graphic method.

Transit Speed No Advantage

Concerning speed, it is true that more shots may be observed with a transit in a given time, as the transitman reads only the shots in the field, while the topographer reads and plots the shots and sketches the topography. The fact that many more shots are taken does not signify that a greater amount of work is accomplished, since in using the transit almost twice as many shots must be observed.

This fact is true because the draftsman in the office has never seen the area to be mapped, and the additional shots are necessary to insure that

the detail may be correctly sketched—detail that is seen and sketched in the field by the planetable topographer. Thus, the smaller number of shots required with the planetable method offsets the greater number observed in a given time with the transit. In addition, no man can achieve from field notes the correct expression of the contours of an area he has never seen.

During January, February, and March of 1942 in the Norfolk and Portsmouth areas of Virginia several groups were engaged in making topographic maps of six federal housing projects. The nature of the topography in all areas was very similar. One group, using the planetable and alidade, performed its work at a unit cost of $4.50 per acre. This included necessary horizontal and vertical control and the delivery of a pencil copy of the map sheet.

The unit price of the other groups, under the same conditions, ranged from $15 to $30 per acre. The transit method used by them was the first method as described in this article. Through time saved and the need of less men, the planetable achieved this economy. Other instances of a like comparison are known although figures are not immediately available.

Further proof of the value of the planetable is illustrated by the work now carried out by this method. The U. S. Geological Survey has for a good many years considered the planetable a basic necessity for producing the standard quadrangle maps of the United States, in fact, uses the planetable exclusively, except for those areas now mapped by stereoscopic methods. The Corps of Engineers, U. S. Army, recognizes the worth of the planetable as shown by its use in the training of the Topographic Battalion of the Corps. Also, the major oil companies use the planetable to make reconnaissance topographic maps for oil exploration and geologic study. With the U. S. Coast and Geodetic Survey it is a standard piece of equipment. This wide use should be tangible proof that the planetable excels the transit for topographic mapping.

To summarize, the keynote of the planetable method is flexibility, simplicity, and adaptation to the conditions encountered. The planetable has been pictured as being a bulky, cumbersome outfit, requiring many hands in its use. It cannot be too strongly emphasized that this impression is erroneous, as the modern planetable with its light efficient Johnson tripod head and the compact telescopic alidade is easily carried by one man, and just as easily maneuvered through brush. In addition, the greatest advantage of the planetable is that it makes it possible to prepare accurate topographic maps on medium and small scales with a minimum of time, control, and cost. Using large scales, the element of control is the only one to differ, as it needs an amount almost equal to that of the transit method, while keeping the advantage of the factors of time and cost.

Status of Topographic Mapping in Alaska

*CHARLES F. FUECHSEL**

THE discovery of gold in Alaska and the Yukon Territory during the nineties revived exploratory activity which had been neglected for several decades. In earlier years the establishment of trading posts along the Yukon and Kuskokwim Rivers had engendered some knowledge of Alaska's interior, but such information was confined to the proximities of those rivers and their major tributaries. Previous to the explorations by the Russian-American and Hudson's Bay Companies, the recorded knowledge of Alaska consisted of crude charts of the southern and western coastal areas assembled from the observations of Bering, Chirikof, Cook, Vancouver and others.

Geological Survey's Program

The stimulus of interest in exploration and, in turn, reconnaissance surveys afforded by the gold rush, launched the U. S. Geological Survey's systematic investigation of the mineral resources of Alaska, which has continued to the present day. Appropriations for this work, though continuous, were extremely small and had to cover also reconnaissance topographic mapping which was needed to facilitate the geologic investigations. To date, approximately half of Alaska[1] has been topographically mapped on reconnaissance standards (1:250,000 scale with 200-foot contours) under this program. In addition the Survey has mapped nearly 5,000 square miles on scales of 1 inch-to-the-mile or larger for detailed investigations.

The maps were compiled from field surveys supplemented to an increasing extent in recent years by photogrammetric processes. The force engaged in this work was extremely small—often comprising only two or three topographic engineers on the permanent staff. The regular work has been suspended for the duration in order to meet the world-wide requirements for aeronautical charts.

Topographic Mapping by Other Agencies

The International Boundary Commission from 1907 to 1913 mapped

* Senior Topographic Engineer, U. S. Geological Survey.

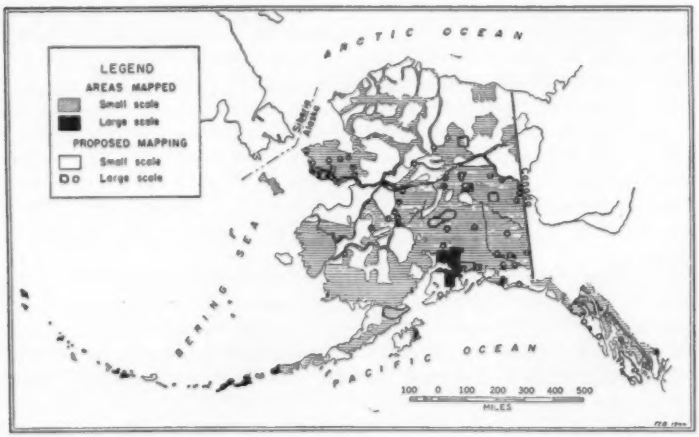
[1] Total land area of Alaska is now estimated to be about 580,000 square miles.

approximately 3,000 square miles along the 141st meridian. Half of this mapping is on the Alaska side of the boundary. Coastal topographic mapping, as required for the nautical charts of Alaska has also been accomplished by the U. S. Coast and Geodetic Survey. Over 12,000 square miles has been mapped by the War Department for immediate military requirements in the recent emergency.

Postwar Mapping

Although the unmapped part of Alaska is being surveyed in connection with the world-wide charting program, the compilation objective is for a 1:1,000,000 scale publication. Time requirements and the purposes for which the charts are to be used do not justify the compilation of these areas with accuracy comparable to the standard reconnaissance surveys. Therefore, a postwar program entailing supplementary control surveys and some topographic mapping in the field, as well as office compilation projects, will be necessary to complete the 1:250,000 scale coverage of Alaska.

Because of the conditions governing Alaska mapping in earlier years, during which time available funds and other expedients precluded the



Sketch showing status of topographic mapping in Alaska—February 1944.

opportunity for accurate control surveys, readjustment of previous mapping to newly established control will be necessary. Consequently, this will also be the appropriate time to convert from the old system of mapping

discontinuous areas, of various sizes and shapes, to a systematic scheme of publication on a modified quadrangle basis.

It is inevitable, in view of the present accelerated development of Alaska and its future prospects, that larger-scale maps will be required in certain critical areas for many activities, as well as for the investigation of Alaska mineral resources. The present estimate of probable postwar needs are shown in the accompanying outline map and table. Conjectural elements are such, however, that the ultimate story may refute our present estimate of future requirements.

Topographic Mapping in Alaska

(Approximate figures in square miles)

Type of mapping	*Mapped to date*	*To be revised*	*Unmapped*
Exploratory	85,000	.....	.....
Reconnaissance	275,000	45,000	300,000
Detailed	20,000	2,000	15,000
Planimetric only	300,000	.....	.....

To summarize, it appears that our postwar efforts in Alaska will involve (1) field surveys for supplementary control and map completion, (2) laboratory mapping by tri-metrogon and multiplex methods, and (3) cartographic adjustment of old surveys in addition to the preparation of new data for publication.

Small-Scale Versus Large-Scale Mapping

In connection with the topographic mapping of Alaska there is brought to mind one phase of President Whitmore's excellent paper, "Opportunities After The War," which appeared in the July 1943 issue of the Bulletin of the American Congress on Surveying and Mapping. Mr. Whitmore, anticipating a new appreciation of surveys and maps, suggests that clients "will be more discerning as to quality . . . and not so easily fooled by the rapid, low-cost reconnaissance type products." It is realized that the author's intent was not to disparage the low-cost product, but to encourage planners to allot sufficient funds for the more detailed types of surveys. However, it must be evident that, as a case in point, the 1 inch-to-the-mile maps for the whole of Alaska would be extremely difficult to justify on a cost versus actual requirements basis. The analogous condition will doubtless prevail for a substantial portion of the earth's surface for many years to come. To meet the conditions wherein projects of the large-scale type cannot be developed at an early date, the reconnaissance map has appeal for its relative speed, low cost, and utility for general studies and planning purposes. Case histories usually indicate that from the general studies

potentialities are discovered which require the large-scale mapping of certain critical or highly promising areas.

Unfortunately, the theoretically ideal sequence—large-scale mapping, with the smaller-scale editions purely cartographic rearrangements of the original surveys—is rarely realized. The actual story, from practical expedience, is usually (1) reconnaissance surveys, (2) selected detail surveys, and (3) eventual general coverage on standards meeting needs wherein portions of the older selective surveys prove somewhat inadequate. It is apparent that the field investment in (1) and, to some extent, (2) could have been conserved in a horse-before-the-cart arrangement. However, the consensus recently expressed by many authorities indicates that world-wide reconnaissance mapping projects will probably be undertaken in the postwar period utilizing available tri-metrogon photography and compilation processes. Such operations will doubtless develop many detailed survey projects in the wake of the general planning and development programs which the reconnaissance map facilitates. The proponents of large-scale mapping should therefore gain more in the long run by encouraging the adoption of a reconnaissance program for areas which have not yet reached the stage of economic development wherein the expensive large-scale program can be justified.

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THE GREAT SOVIET WORLD ATLAS

IN THE JUDGMENT of competent authorities this is the finest Atlas which has ever been published. It is to be published in three volumes, Volume I only being now issued.

The scholarship is thorough and the reproduction outstanding. The plates are beautifully printed by offset presses, and many of them used 15 or 20 colors. The paper is rag stock, and there is a special binding which makes it possible to remove individual maps. Editorial work cost 5 million roubles, while publication cost 20 million roubles more.

Volume I deals with the world as a whole and the Soviet Union as a whole. Some of the outstanding plates are the world maps of soils, natural vegetation, trade, national ownership of railways, population, and mineral resources. There is a new climatic region map specially revised by Koeppen. A wealth of material also throws light on the resources of the Soviet Union. Many maps are double and triple page size.

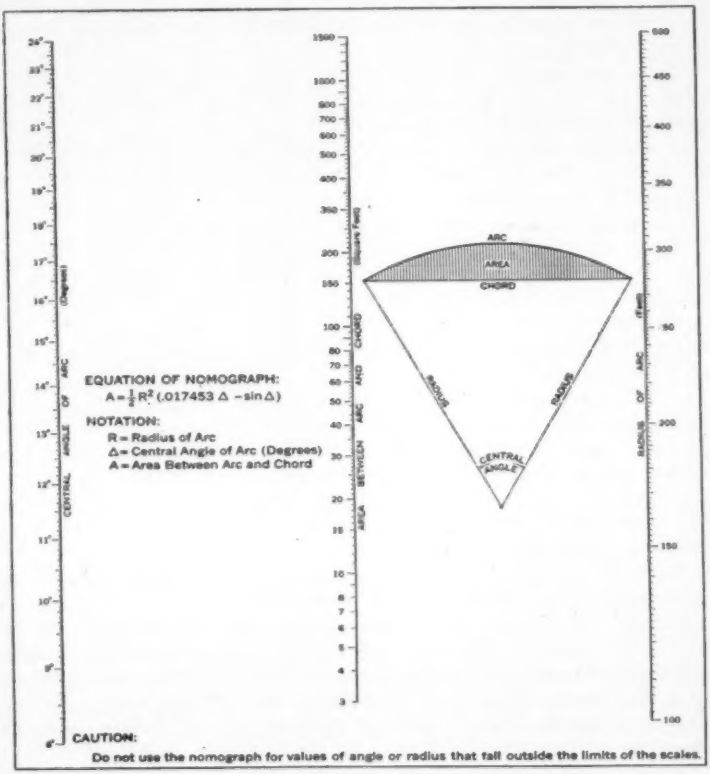
Since the Atlas is in Russian, its use has naturally been very limited; but the Department of Geology and Geography of Syracuse University, New York, has come to the rescue and have translated into English all the Titles and Legends of Volume I. These are now available in a litho-printed book of 100 pages. Place names are not generally translated, because the Atlas deals largely with economic, cultural, and physical aspects. No knowledge of Russian is needed to use the Translation Volume, as the appropriate symbol is shown opposite each item in the Legend.

Volume II and Volume III, not yet published, deal respectively with the Soviet Union in detail and with foreign countries.—*Scottish Geographical Magazine*, January 1944.

Nomograph for Land Surveyors

RALPH MOORE BERRY, Registered Land Surveyor

IN COMPUTING lots in a subdivision, the land surveyor frequently must calculate their areas. If a lot has one or more curved sides, the procedure is to compute the area of the lot as if bounded by straight sides and then to add or subtract the area between the curved side and its corresponding chord. The nomograph illustrated will assist in obtaining this correction.


CENTRAL ANGLE OF ARC (Degrees)
AREA BETWEEN ARC AND CHORD (Square Feet)
RADIUS OF ARC (Feet)
ARC
AREA
CHORD
RADIUS
RADIUS
CENTRAL ANGLE
EQUATION OF NOMOGRAPH:
$A = \frac{1}{2} R^2 (.017453 \Delta - \sin \Delta)$
NOTATION:
R = Radius of Arc
Δ = Central Angle of Arc (Degrees)
A = Area Between Arc and Chord
CAUTION:
Do not use the nomograph for values of angle or radius that fall outside the limits of the scales.

To use the nomograph, connect with a straight line the point on the left-hand scale corresponding to the value of the central angle of the arc with the point on the right-hand scale corresponding to the radius of the arc. The point where this line crosses the center scale gives the area between the arc and the chord.

Signal Lamp for Night Surveying

Douglas L. Parkhurst, U. S. Coast and Geodetic Survey

A NEW low-weight lamp reasonable in first cost, stronger than previously available units, and permitting accurate placement with respect to the station mark has been developed for night surveying. Built of cast aluminum, the unit was designed for use as an illuminated target for precision triangulation surveys at night, when the effects of atmospheric refraction are minimized.

Basic requirements for the new lamp were, in their order of importance: (1) To provide a powerful ray of small divergence; (2) To develop a design permitting as many as four or five lamps to be "stacked" over a station, with the focal points of the reflectors lying in a vertical line through the mark; and (3) To incorporate rugged construction, light weight and simplicity of manufacture.

A narrow beam is furnished by the new lamps by virtue of a carefully designed reflector, and a bulb having a specially concentrated filament in the form of a small cylindrical coil, whose axis lies along that of the reflector. A 3.7-volt, 0.6-ampere bulb of this design develops a beam candlepower of over 10,000 at a distance of 95 feet, while a 6-volt, 1.5-ampere bulb of the same design gives a beam candlepower of 70,000 under similar conditions.

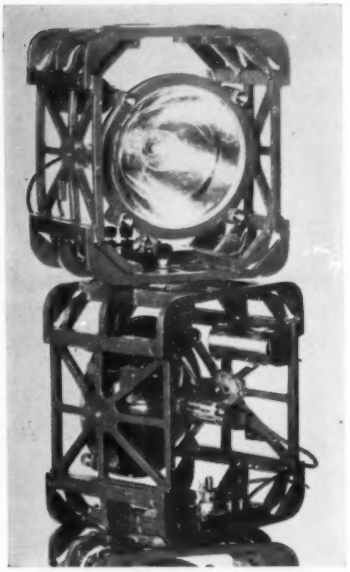
Another important feature is that a number of the lamps may be fastened together to form a vertical stack. Since the ray from each light, no matter in what direction it is pointed, issues from some point on a vertical line passing through the station mark, it is possible to observe simultaneously on the column of lights with a theodolite or transmit from a number of stations, thereby increasing the rapidity with which an area may be surveyed.

With wooden lamps, it is difficult to keep the top and bottom surfaces of the lamp frames flat and parallel, as the wood may warp. Sheet metal lamps also are difficult to construct so that tops and bottoms will be parallel, and unless the sheet stock is heavier than is otherwise desirable, these lamps do not satisfactorily retain their shape. These considerations led to the present design of cast aluminum. The grillwork pattern of the lamp illustrated provides strength and lightness, the corners being strongly braced.

Weight of the lamp is about 5 pounds. (Experiments are being conducted with lamps of an alloy of magnesium to reduce the weight to less than 4 pounds.)

Reprinted through the courtesy of Engineering News-Record, June 1, 1944.

When surveys are being made with these lamps in flat terrain, they are usually mounted on high, steel towers, and in rough country on wooden stands on the peaks of mountains. In either case, the lamps are subject to strong winds, and not infrequently the wind pressure is sufficient to destroy wooden-cased lamps when four or five are steaked together, despite the fact that the corners are strongly braced. This factor was considered in building the lamp illustrated.



Improved lightweight signal lamp

The new design is easy to manufacture. Each element of the frame has four machined surfaces at the joints and by the use of jigs and gang cutters, all four surfaces on two castings (one set) may be machined at once. This method insures the uniformity of the parts and parallelism of the top and bottom surfaces. A ring-shaped bearing surface is machined at top and bottom for the junction of the lamps. The threaded center hole at the bottom is large enough to allow the top fastening bolt of the next lower lamp to pass through, so that any number of lamps may be fastened together.

The fastening bolts are stored in the lamp in a tubular cup held in spring fingers. This cup is quickly and easily made by cutting thin tubing to length in an abrasive cut-off machine. A thin bottom disk cut by the same machine from rod of proper size to fit the inner diameter of the tube is then soldered in place.

The glass bezel in front of the reflector is attached by thumb screws having an interrupted section of thread, so that the screws can be backed off when replacing a bulb, without becoming lost.

The new lamp was developed under the writer's direction.

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"I am told there are people who do not care for maps, and I find it hard to believe." —Robert Louis Stevenson.

Field Notes

Prof. Paul P. Rice, Lafayette College, Easton, Pa.

FOR YEARS and years the orthodox notebook—of approximately 100 pages with a sewed binding and stiff covers—has been in use by the majority of engineers and surveyors, with little thought given to improvement, principally because it was ordinary and the generally accepted article to use. I feel that I can recommend a number of improvements that may be made in notekeeping equipment and procedures, based on special studies and investigations I have made in the last 15 years as well as unusual experiences and opportunities that have occurred over that period of time.

A Loose-Leaf System of Notekeeping

The first suggestion I have to offer is a change from bound books to a loose-leaf system. This has many advantages, particularly in pedagogic procedures; but I will limit my discussion to those you can expect in professional practice. They may be classified into three groups:

1. Economy
2. Convenience
3. Greater Insurance Against Loss

1. *Economy.*—(*a*) The first cost of a binder with a supply of sheets equal to that of the usual bound notebook is higher, of course, than the cost of a single bound book. However, when we consider that a binder, with reasonable care, will accommodate 1,000 or more sheets during its lifetime, the ultimate per-sheet cost of the loose-leaf system compares favorably or is less than an equivalent number of pages in bound books.

(*b*) I am sure you are all familiar with the average run of bound books left behind by our predecessors. The author has an accumulation of some fifty, many of which have only 25 to 75 pages utilized. In engineering offices, interruptions in work frequently occur, necessitating that a generous number of pages be left blank for the completion of that work at a later date. Additional pages are left blank for various other reasons. A bound notebook devoted to general engineering or surveying work completely filled with notes is an exception indeed. Since the loose-leaf system admits of all sheets being used, a definite saving is made.

(*c*) Most notes are valuable, at least for some time, for future record, requiring file or cabinet space and often housing in a fireproof vault or safe.

Presented at Fifth Annual Land Surveyors Conference, New Jersey Society of Professional Engineers, and

Reprinted (with changes) through the courtesy of the New Jersey Engineer, January 1944.

For example, highway engineering work will usually require considerable cross sectioning, the notes of which are not particularly valuable once the job has been accepted and paid for to the satisfaction of all parties concerned. In the loose-leaf system, such notes as gradually become valueless may easily be separated from those filed for permanent record, resulting in economies in file, vault and safe space.

(*d*) Occasionally clients will demand the notes. When that happens, it is simple and but a small expense to surrender them if the loose-leaf system is used.

2. *Convenience.*—(*a*) It is the author's practice to go into the field with a binder containing ⅜″ to ½″ rings, and not more than 10 to 15 blank sheets in the binder. An extra supply of blank sheets is always carried separately. Notes pertinent to the day's work together with other general data may add an additional 10 to 15 sheets, so that the binder seldom carries more than 30 sheets. It is thus possible to lay a pencil and straight-edge in the book without strain on the binding. By placing a fair-sized rubber band over the opening edge of the book, it is possible to carry within the center of the binder all the principal tools necessary for good notekeeping. A pencil and scale cannot be so carried in a bound book without breaking the binding; this necessitates their being carried otherwise, usually in the upper front coat pocket where they are certainly not so convenient and also easily lost.

(*b*) The loose-leaf book always opens flat, a great convenience in both the field and office. No doubt we all have had some experience with ink bottles being used as paper weights to keep open bound books on the drawing board.

(*c*) On many types of engineering and surveying work, the field work and office are separated from the drafting room by a considerable distance. With the loose-leaf system, notes may be forwarded each day so that the drafting work may proceed almost simultaneously with the field work. Furthermore, should an error be made in the field work, it can be promptly detected before the party is too far from the point where the error was made.

(*d*) A draftsman cannot possibly use more than a few pages of notes at one time. By properly paging loose-leaf notes and by using a code, notes may be conveniently separated to a single sheet. There is no waiting for notes where the loose-leaf system is used.

(*e*) It is frequently desirable and necessary to carry into the field supplemental data other than field notes. Such items may include special directions to party chiefs, various tables and charts now available in loose-leaf form, a solar ephemeris, instrument-adjustment data, etc. Any necessary combination of such data may now conveniently be placed right into the notebook, where it is immediately available for use.

(*f*) On many surveys the notes of previous surveys adjacent or

nearby must be taken into the field for reference. In the loose-leaf system, only those notes pertinent to the day's work need be carried rather than several books that may contain data needed by another party.

(*g*) In the author's practice, the notes for anyone survey were tied with string in the outer holes, a loop of proper diameter being made by tying over an ordinary pencil. These were placed in special envelopes having printed on the front various blank spaces for essential reference data. These envelopes were filed alphabetically, according to client, the envelopes in themselves forming one file. A geographical card file, in addition, is all that is necessary to make all the notes available for reference purposes.

(*h*) Occasionally it happens that it is desirable to use on one job two or more types of rulings. In the loose-leaf system different types of rulings may be combined at will.

(*i*) I have recently used metal sheets—cut, round-cornered, and drilled with holes so as to be the exact duplicate of notebook paper—as a backing for the two pages in use. This provides a firm hard surface eliminating sheet curl and permitting the use of harder pencils up to 7H that will hold a sharp point considerably longer than the 3H and 4H pencils ordinarily used. The use of these sheets together with the scale and pencil dsecribed in 2, (*a*) make the binder pop open at once to the two pages desired. The first experimental plates were made from sheet aluminum 0.017″ in thickness. They were very satisfactory in that they were easily fashioned, light, rust-proof, and non-magnetic. Within the last 18 months I have had about 100 pairs prepared from small pieces of galvanized sheet iron as it accumulated in our shop. Of course, these are heavier but not objectionably so after a book has been used a few days, but care must be exercised in their use to avoid disturbance of magnetic readings.

(*j*) My experience with the duplicating book is not too satisfactory. However, under certain conditions they must be used. The use of a metal sheet as just outlined together with a harder pencil will result in a clearer carbon copy and the rings are a great help in holding the carbon paper in place. It is desirable, in this connection, to use a double sheet perforated along the fold so that the carbon copy does not slide with respect to the original.

3. *Greater Insurance Against Loss.*—(*a*) The main argument that has been made against the loose-leaf system is the possibility of loss. Through a proper coding and paging of sheets, at the time the notes are made, no difficulty has occurred in the author's experience with single sheets. As far as whole notebooks are concerned, one type may be lost as easily as the other, or if there is any difference, it is in favor of the loose-leaf binder used as described in 2, (*a*), the rubber band offering some resistance to sliding from a pocket.

(*b*) As pointed out in 2, (*f*), only those old notes pertaining to the day's work are carried into the field. The loss of any notes is always serious. In the method described, only a few notes could be lost as compared to the loss of an entire bound book, or books. It should also be mentioned that it is a far easier task to carry, look after, and account for one notebook as compared to two or more bound books as is sometimes the case when there are several pertinent surveys in different books.

(*c*) It is the author's practice to place on the first loose-leaf sheet statements of ownership, value of the book, directions for return, a nominal reward, etc., so it may be returned if lost and found. Of course, this may be done in a bound book. However, as each new book is started these statements must be copied. So much for the loose-leaf system.

A Standard Code of Symbols

The second suggestion I have to offer is the preparation and use of what I would like to term a Standard Code of Symbols for Field Notes. I have been on the lookout for such a Code for 15 years in my own extensive collection of surveying books and the excellent collection in the College Library. All told, more than 600 surveying books are readily available to me, some from English-speaking foreign countries, but I have not located the answer. What I have in mind is a Code similar to the "Standard Symbols Adopted by the Board of Surveys and Maps, United States of America," with which many of you are familiar. Of course, these symbols are for small-scale maps approximately 1 mile to the inch and are, therefore, not adaptable for field note use. We need standard symbols to indicate such things as poles, lamp standards, manholes, catch basins, fire plugs, alarm boxes and a large number of other topographic features we must show in field notes. Standard symbols have been used in plumbing, electricity, chemistry and other fields with manifold benefits. Would it not be fine if a certain symbol—easy to make and as suggestive as possible of the object it represents—would indicate a manhole to every engineer and surveyor in New Jersey? Still better to every engineer and surveyor in the United States and Canada. It seems to me that in New Jersey where we have heavily populated industrialized areas to small villages, woodlots to intensive cultivated farms, mountains to seacoast, and above all one of the most active groups of engineers and surveyors in the country that we can develop a code of symbols for field notes adequate for our needs and with slight modification satisfactory for the other 47 states.

A code of symbols such as I have suggested would also have valuable use in large-scale maps. Many of you are familiar with the maps required by the refining companies commonly called "gas station surveys" where the engineer and surveyor is requested to locate every last detail from the lilac

bush to the dog coup as well as all sub-surface structures and utilities. The representation of these details on maps even though the scale is large, such as 1 inch equals 10 feet, becomes a problem—so a code of symbols as I have suggested for field notes would also be valuable for this type of map.

I have thus indicated to you two major improvements that may be made in notekeeping. Unfortunately, loose-leaf binders have become very scarce. However, in case you have the idea that field notebook binders are a special item sold only by engineering supply houses, it is pertinent to mention that every major manufacturer of loose-leaf devices produced a binder of the size and 6-ring spacing commonly used for field notebooks. These were sold and used for many general and special purposes. If you have never used the loose-leaf notebook and wish to try it, a little searching on your part will very likely locate a used binder just right for notekeeping.

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TERCENTENARY OF THE INVENTION OF THE BAROMETER

ON OCTOBER 19TH, 1943, a meeting was held at Toronto to commemorate the three-hundredth anniversary of the invention of the barometer by Torricelli in 1643. It is probable that had the world been peaceful at the time, the celebration of this important event would have been more widespread, and have attracted much greater attention.

Two interesting lectures were given dealing with, what might be called, the background of Torricelli's famous experiment and the philosophical reactions and effects consequent to it.

At the conclusion of the addresses the original Torricellian experiment was performed of filling a tube with mercury, inverting it so that the open end was in a dish of mercury and showing that the atmospheric pressure would support a column of mercury about 30 inches in height. The experiment was carried further—a development I saw for the first time. To demonstrate that the space above the mercury was really a void, and not full of air or some other substance, Torricelli reasoned that if water were poured on top of the mercury in the dish and the tube lifted until its open end was above the mercury surface, but still below the water surface, water would flow in and displace the mercury. As the density of mercury is 13.6, the water would completely fill the short tube—which would have to be over 34 feet long before a space would appear above the upper liquid surface, as in the case of the mercury. This phenomenon was demonstrated successfully before the audience.—R. H. Field in *The Canadian Surveyor*, January 1944.

Fluorescent Charts*

LIEUT. COMDR. PAUL A. SMITH, U. S. Coast and Geodetic Survey

AMONG many war uses of luminescent materials, fluorescent charts and maps have occupied an interesting place. It was not entirely a new problem. Ultraviolet light and its associated phenomena had already undergone numerous practical applications, particularly in Europe and England, including printing with fluorescent ink. The perfection of the paper, however, is a real tribute to the paper and metallurgical industries of this Country.

Fluorescent charts, tables, and other printed matter are used by Air Forces pilots and bombardiers primarily because aircraft are equipped with an ultraviolet light source for other reasons; and this light is invisible if inadvertently directed toward the enemy. Practically all charts are printed on offset lithographic presses, and many millions of charts must be produced annually. When the chart makers were confronted with this war requirement, the first and most obvious solution was fluorescent inks applied by offset press to ordinary white chart paper. Inks were produced which would fluoresce in colors similar to the conventional chart colors seen in daylight. A uniform light yellow fluorescent base is usually applied to the paper in this process because the uncoated paper appears dark under ultraviolet light, and marginal notes and other printed material must be illuminated.

Fluorescent illumination for aeronautical charts—as a possible measure to increase safety in night flying—was studied by the Civil Aeronautics Administration several years before the war. The conclusion of that study, where the element of detection of light source by hostile observers was absent, was that no outstanding advantage was apparent over normal cockpit lighting methods. The tests carried out at that time had afforded chart makers some opportunity to appraise various methods of applying fluorescence to charts printed in the transparent lithographic colors normally used for this purpose. The results of experiments conducted at that time indicated that a very presentable print could be obtained with fluorescent inks and fluorescent coatings applied by an offset lithographic press.

The question of dark adaptation and night vision was involved. The Navy had already adopted red lights for cockpit use in planes, naval sur-

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* Presented at Annual Meeting, Technical Association, Pulp and Paper Industry, February 15, 1944.

geons having concluded from extensive experiments that little loss in dark adaptation occurred when objects were viewed under light of longer wave lengths than 600 millimicrons. At low levels of brightness, however, the difference in loss of visual acuity, after viewing a lighted surface in the red as compared to nearly equal brightness in the orange-yellow region, is of less importance than was supposed at first.

The Navy, having already adopted a red light for planes and other craft, requires that all colors used on charts be visible under red lights. The British seem to prefer amber illumination for charts. The chart producers in the United States are therefore required to make charts which are "visible under red, amber, ultraviolet, and daylight," and this note appears on charts which are so prepared. Although red illumination does preserve dark adaptation somewhat better than the yellow-orange light, the difference at low levels of brightness does not seem to be an important factor. The better chromatic values obtainable under the orange-yellow illumination make it possible to use a wider range of colors on the chart to emphasize certain charted information than does the deep red. This conclusion was reached from comprehensive tests made at the National Bureau of Standards on fluorescent samples, as well as practical tests made by the Army Air Forces.

A review of the problem revealed that several methods for making fluorescent charts were possible, ranging from printing with fluorescent inks to the application of fluorescence in the manufacture of the paper. The latter offered the greatest advantages—if it could be perfected—because in this event it could be used with the least change in ordinary chart printing processes. The nearest available approach to this at the time was a thin coating of fluorescence applied to the conventional chart paper before printing, with the possible additional use of fluorescent inks as necessary. This method was, therefore, put into immediate use by the War Department.

A fluorescent paper which would produce the desired effect with ordinary lithographic inks was obviously an attractive possibility. Inquiries from experts at the Government Printing Office, the National Museum, the National Bureau of Standards, and the Geophysical Laboratory of the Carnegie Institution of Washington indicated that a satisfactory fluorescent paper might be produced in the quantities necessary within a few weeks. After several conferences with representatives of a number of paper manufacturers and the War Production Board, satisfactory preliminary samples of coated paper were produced by the industry and the fluorescent paper was put into use by the Coast and Geodetic Survey. Because of limitation on quantities of fluorescent pigments, the coated paper seemed to be the most practicable. It had certain disadvantages, the main one

being that it was to a slight degree subject to the same weakness of the printed-on fluorescence; that is, the fluorescence could be scraped off if hand corrections by knife erasures were made.

A new map paper, having unusual properties of wet strength, was under development for the War Department about the same time as the fluorescent paper was being tested. It was obviously desirable to use the same base stock specifications for the fluorescent paper as for the new chart paper without fluorescence. Preliminary mill runs were promising although costs were naturally higher than coated paper. Eventually, however, a satisfactory sheet was produced on identical specifications to the new, high wet-strength paper. Fluorescent brilliance and color were satisfactory to the Air Forces and this paper is now standard for Air Forces fluorescent charts.

As stated by Dr. Stutz,[1] it is possible to obtain almost any fluorescent color desired with stable inorganic pigments. It is therefore possible to match daylight chart colors with fluorescent colors if the additional fluorescent brilliance is required. So far, however, the fluorescent paper seems to be satisfactory, and the additional use of fluorescent inks has not been needed. Ordinary lithographic inks used for chart printing are nearly transparent. When fluorescent pigments are added, the ink becomes slightly more opaque.

Specifications for the fluorescent color and brilliance are, in the case of the chart paper, based upon National Bureau of Standards recommendations. Briefly, they require that the fluorescent brightness shall be 200 microlamberts, and fluorescent chromaticity coordinates $x=0.514$, $y=0.478$ when the density of radiant flux of wave length 365 millimicrons is 3.2 microwatts per square centimeter (NBS Test No. IV-3/43P-75/43). A secondary standard consisting of a paper sample meeting the above specifications is generally supplied to the manufacturer as the most practicable control during production.

Since aeronautical charts are generally used in daylight or under ordinary artificial light, care is taken that the addition of fluorescent properties does not impair their utility and legibility in daylight or white light.

A word may also be said about other fluorescent documents used by pilots and aircraft personnel under ultraviolet light. Tables, navigational data, and other printed matter have been produced by the Government Printing Office and others with fluorescent ink on black paper; by offset printing with a reversed plate on fluorescent paper using black ink; and by a process whereby letters and figures are printed with a letter press on black material.

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[1] Stutz, G. F. A.: Luminescent Pigments, *Technical Association of the Pulp and Paper Industry*, February 1944.

At present, fluorescent charts are produced solely for war uses. The simplest and most satisfactory method yet found is the use of the fluorescent paper with ordinary printing inks and ordinary printing processes.

Fuorescent charts and other articles produced in fluorescence are spectacular in appearance. Obviously, future advances in this field may be expected as the phenomenon is applied to more and more utilitarian requirements, and the basic materials become more plentiful.

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HYDROGRAPHIC SURVEY FOR DOCK LOCATION

THE HYDROGRAPHIC SURVEY described below was made by the Engineer Section of the 339th Engineer Regiment (GS), Colonel J. W. Cox, Jr., commanding, under the direct supervision of Technical Sergeant Joe F. Garrigan (formerly of Memphis District, U. S. E. D.). The purpose of the survey was to locate sites for several timber pile-supported docks built by the regiment in New Guinea.

To locate docks correctly so as to obtain adequate depth of water (30 feet) to accommodate anticipated shipping and at the same time to keep pile lengths to a minimum a hydrograph of high degree accuracy was required. Since the bed was composed of an irregular coral formation with pinnacles up to 5 feet, random soundings were variable with consequent inaccuracies in the hydrograph. The procedure described below gave effective results.

A control traverse, or base line, was first established with transit and steel tape approximately parallel to the shore. When plotted on the planetable sheet to large scale (1 inch = 50 feet), the traverse points served as control for establishing planetable stations at intervals of about 200 feet along the shore. A stake was then driven at the water's edge near each planetable station to serve as a pivot point. On the planetable sheet, arcs were scribed with pivot point as center and radii increasing by increments of 10 feet to scale.

With the planetable set over one planetable station and the tag line attached to the pivot stake, actual soundings were begun. The boat party including leadsman, recorder, and necessary oarsmen moved out into the bay along an arc the radius of which was positively controlled by tying the tag line to the stern of the boat at the position occupied by the leadsman. Soundings were taken at approximately 10-foot intervals along the arc. The exact location of each reading was established by drawing a tick mark along the telescopic alidade on the appropriate arc. Depths were recorded by the recorder in the boat who numbered the readings consecutively along each arc. Depths, corrected to mean low water, were later entered on the

hydrograph. Successive 10-foot increments of radius were run until depths of approximately 50 feet were reached. The procedure was repeated at each planetable station allowing arcs to overlap those taken at adjacent stations. By alternating direction on successive arcs (right to left and left to right) the work was done with a minimum of lost action.

The advantages of this procedure over other methods are: (a) Exact location of each depth with respect to survey control points; (b) positive control over spotting of soundings, thus preventing blank spaces on the resulting hydrograph; (c) degree of accuracy predetermined by radii increments and spacing of soundings along arc; (d) continuity assured by overlapping arcs; (e) reduced office work; hydrograph is complete, except for contours, when party leaves the field.—Second Lieutenant Alton L. Cardinal, Corps of Engineers, in *The Military Engineer,* December 1943.

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THE LIFE OF A SURVEYOR IN JAMAICA

. . . The established custom has been for the client of a private surveyor to supply whatever laborers are needed at a survey, and as the task of working in a survey party has been a popular one, the surveyor has been sure of getting the best help.

The client who was a small settler would not be able to afford the expense of employing a gang of laborers, but his friends would turn out on the day of survey, ready and willing to do whatever was needed. These friends would not expect to be paid for their services but they would expect to be fed, and many a fowl or goat found its way to the pot on the day of a survey. Liquid refreshments, comprised principally of Jamaica rum and water coconuts, were needed also if local etiquette was to be obeyed, so it is not surprising that no one felt inclined to do very much work after lunch.

Unkind people have alleged that a surveyor, having partaken both of the lunch and of the rum, and having become somewhat unenergetic shied an empty bottle as far as he could into the bush and then announced to his client: "Where that bottle fell is where your corner lies!" Instances have been reported in which overlaps of boundaries have resulted from this novel way of establishing corners, but the best, even though apocryphal, story of an overlap concerns a surveyor who worked for two neighbours but at different times. This surveyor, much to the disgust of his client's neighbour, ignored a plan and surveyed a boundary in such a manner that the client gained a large portion of his neighbour's land. Some years later the positions of client and neighbour were reversed in relation to the surveyor, and the original mistake was rectified with the simple explanation to the former client: "You have had the land long enough and it is time for you to give it back."

Those halcyon days are long past and the present-day surveyor takes as many trained men with him as each survey warrants. As a result, a festive air no longer surrounds a survey, and it is not likely that the experience of a surveyor who preferred to share his client's couch in a one-room hut, while the peasant's wife and offspring slept on the floor with the couch as canopy, to taking a ride on mule-back of some fourteen or fifteen miles, will be repeated.—H. F. Edwards in *Empire Survey Review,* January 1944.

Federal Surveying and Mapping Agencies

This is another in the series of sketches of the history, purpose, and scope of activities of federal agencies engaged in surveying and mapping.—EDITOR.

TENNESSEE VALLEY AUTHORITY
(Maps and Surveys Division)

FOLLOWING its creation by Congress in 1933—in the depth of the great depression when a prompt beginning of the construction of the huge reservoir projects contemplated by the Act was highly desirable—the Tennessee Valley Authority faced the need to quickly appraise the requirements for planning and getting under way a huge unified program of navigation, flood control, and hydro-power—as well as for planning regional development along other lines—for a great river valley 700 miles long, embracing more than 40,000 square miles, and populated by 2,000,000 people. Immediately, attention was focused on the dearth of up-to-date survey information and the complete absence of accurate, comprehensive maps. Base maps for broad planning, detail maps for project-design studies, and various types of ownership maps for reservoir-land acquisition programs were in immediate demand.

In recognition of the urgent problems at hand, the Maps and Surveys Division (formerly Engineering Service Division) was set up as part of the Authority's original organization to furnish virtually all needed surveys and maps in the various categories. For 11 years this organization has been engaged in supplying the Authority's surveying and mapping needs. Among other items, planimetric maps have been made for the entire watershed; topographic maps have been completed for most of the eastern half of the Valley; and detail-cadastral maps, covering 2,000,000 acres largely in the reservoir areas, have been produced.

PLANIMETRIC BASE MAPS

In order to expedite the preparation of the base maps needed for general planning, the U. S. Coast and Geodetic Survey began extending its horizontal and vertical control throughout the Tennessee River basin, and by the

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Prepared in the Office of the Tennessee Valley Authority.

end of 1934 practically all the basic geodetic control had been established. Under a cooperative arrangement with the U. S. Geological Survey, three-color planimetric base maps were completed for a total of 42,000 square miles in about 3½ years. They are printed in standard lithographic form on a scale of 1 inch equals 2,000 feet.

These maps were constructed on the polyconic projection from 5-lens aerial photographs, geographic control being secured by means of secondary triangulation and by third-order traverse spaced at 5- to 6-mile intervals. Approximately 800 of the 7½-minute quadrangle sheets were required to cover the entire Tennessee River drainage basin. Limited supplies are available in the Tennessee Valley Authority files, the original plates being deposited with the Geological Survey in Washington.

Topographic Base Maps

Immediate planning needs having been partly satisfied by the planimetric maps, a program was initiated for producing accurate five-color topographic maps of the Valley on the same projection and scale. Since the beginning of this program in November 1936, some 15,000 square miles, covering most of the eastern half of the Valley, have been completed. Due to the Division's participation in urgent, military-mapping assignments, the work is now progressing at a reduced rate—about 1,500 square miles per year. The topographic base maps correspond in coverage to the 7½-minute quadrangles of the planimetric series. Contour intervals vary with the terrain—40 feet in the more mountainous regions, 20 feet in semi-mountainous and rolling localities, and 10 feet in relatively flat areas. Auxiliary contours at half the standard intervals are shown, where necessary, by dash lines.

The major portions of the maps are compiled from aerial photographs with the aid of multiplex projectors, supplemented by planetable topography in flat terrain. Photographs used are made with a single-lens camera under rigid predetermined specifications as to altitude, scale, overlap, etc. The machine-plotted manuscript maps are then inspected in the field, at which time roads and buildings are classified, place names and political subdivision boundaries are added, vertical and horizontal accuracy tested by standard profile methods, and detectable plotting errors are corrected. After a thorough office check the revised manuscript is released for reproduction. The U. S. Geological Survey cooperates on multiplex operations.

Although published on a polyconic projection, the maps show registration marks for the State Plane Coordinate Systems. Supplies of such maps as are not restricted are on file with the Central Map and Drawing Services, Tennessee Valley Authority, and are available to the public at a small cost.

Reservoir Mapping

To date, the Authority has completed or has under construction 18 dams (including the raising of Hales Bar and Wilson Dams) which impound reservoirs ranging in area from less than 1,000 acres to approximately 260,000 acres. The reservoirs of the nine main river projects will form a continuous chain of lakes more than 600 miles long, extending along the Tennessee River from Kentucky Dam—22 miles above the mouth—to its source at Knoxville. The other nine projects are located on tributaries in the eastern part of the basin. Construction and preparation of the reservoirs required a large volume of surveying and mapping, much of which was performed by new and unique procedures.

Cadastral Maps

On the earlier projects land-ownership maps—which serve as the reservation-map base—were prepared from aerial photographs enlarged to a scale of 1 inch equals 500 feet and used in the field as planetable sheets. Ownership boundaries, buildings, roads, streams, the required reservoir pool contours, etc., were delineated directly on the photographs. Property corners were transferred and photographic distortion rectified by radial-line intersection methods from the photographs to sheets on which horizontal control had been plotted, and from these sheets the final land maps were traced. In transferring cultural features, radial adjustments were made in order to eliminate relief distortion. The maps cover, besides the flooded area, a strip extending a quarter to a half mile beyond the lake shore.

For the recent projects the surveying procedure was revised by preparing in advance planetable sheets from aerial photographs using the multiplex equipment. These sheets showed the control and required planimetry and were sent to the field for delineation of property lines and completion of the survey. Under this method no further correction for relief displacement and scale was required. This permitted the land-ownership maps to be traced directly from the completed planetable sheets. The large amount of detail shown upon these maps is found of great aid to the land appraisers.

Boundary descriptions and areas measured directly from these maps prove entirely satisfactory for the purchase of tracts of 10 acres or more, the average area errors by numerous tests having been found to fall within about 1 percent.

Reservation Maps

The reservation maps, as the name implies, are primarily maps of the government ownership or reservation; but show, in detail, culture and drainage lines above lake elevation, contours of critical reservoir levels,

and relocated or reconstructed roads and other facilities. The maps are compiled principally from land-ownership maps made for internal use within the Authority in the acquisition of the land and land rights needed for each project. Since all the Authority's cadastral surveys are based on the State Plane Coordinate Systems as laid out and recommended by the U. S. Coast and Geodetic Survey, the appropriate plane coordinates of each boundary corner and monument are given on the maps, together with the grid bearing and length of each boundary course.

The compilation scale of the reservation map is usually 1 inch equals 500 feet, but in urban or highly developed areas scales of 1 inch equals 100 or 200 feet are used. Reduced reproductions by the multilithic printing process are made on 11- by 17-inch sheets, the usual scales being either 1 inch equals 1,000 or 1,320 feet, depending on the size of the original tracing.

Reservation maps have been completed on 11 of the projects, and copies are on file with the Central Map and Drawing Services, Tennessee Valley Authoriy, in Chattanooga and Knoxville.

Navigation Charts

Navigation charts are being prepared for general public distribution after the war to cover the entire chain of lakes along the main river and some of the tributary reservoirs. The charts are compiled from the land-ownership maps, reservation maps, and the planimetric and topographic base maps. They cover several miles beyond the lake shores and show the planimetry, the government reservation boundary, and navigation data. The navigation information includes the main sailing line; tributary channels; buoys, lights, and day boards; safety harbors; river gages; submarine cables and pipes; submerged stumps and rocks; docks; bridges; and contours of lake bottom. The maps are reproduced by lithograph in four colors on 20- by 30-inch sheets to a scale of 1 inch equals ½ mile.

Survey Control Bulletins

To make available information on control monuments established in survey work throughout the Valley, survey control bulletins are compiled and issued in mimeograph form by the Division. Each bulletin describes the horizontal and vertical control monuments in a 15-minute quadrangle (four topographic maps) and gives geographic coordinates, rectangular coordinates (if available), elevations and datum used. As they were published several years ago, some of the more recent monuments are not included. However, it is planned to issue supplements as soon as pressing war-mapping work permits.

Military Mapping

Since March 1942, the Division has been mapping strategic domestic areas for the Army, and to date has completed more than 80 percent of the 24,000 square miles assigned. About 60 percent of this was done by multiplex methods, the remainder by planetable on base sheets prepared with the multiplex machines.

For the past year, a large part of the Division's personnel has been assigned to a foreign-mapping program. The work includes three multiplex and color-separation drafting assignments of from 4,000 to 8,000 square miles each on scales of 1 : 25,000 or 1 : 50,000, and the production of 140,000 square miles of complicated compilation jobs to be reproduced in from 9 to 12 colors on a scale of 1 : 100,000. In addition, two photo-revision projects were accepted for 1 :50,000 scale maps covering 10,000 square miles; and three for 200,000 square miles at a scale of 1 :100,000. Most of the work has been completed.

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A "TVA" FOR PALESTINE

" . . . A Commission on Palestine Surveys is working on plans for a great hydro power and irrigation project for Palestine, modeled somewhat after our Tennessee Valley Authority plan and called the Jordan Valley Authority project.

"The guiding principle of the plan is to assure that no water shall be wasted. Thus, all the fresh water of the Jordan rivershed is to be impounded by dams in the upper reaches, from which it will be conducted to agricultural lands through 450 miles of irrigation canals on both sides of the downstream valley. The larger dams would also include hydro power plants. But, as this plan would dry up the Jordan River and thus deprive the Dead Sea of inflow necessary to maintain its level in the face of tremendous evaporation losses, there is provided a canal and tunnel to bring 1,000 cfs. of Mediterranean water into the upper end of the valley, from whence it would flow to the Dead Sea in a concrete-lined channel. The drop of 1,200 feet in this canal would be utilized for other hydro installations.

"Originator of this comprehensive scheme is Dr. Walter C. Lowdermilk, Assistant Chief of the U. S. Soil Conservation Service. He has described it in a book, "Palestine, Land of Promise," published several months ago, which is worth the careful attention of engineering readers. . . . ."

—Editorial, *Engineering News-Record*, June 15, 1944.

The Watchmaker and the Scientist—An Almost Forgotten Controversy*

CAPTAIN *J. M. SHEEHAN*, U. S. NAVY

Now there be some that are very inquisitive to have a way to get the longitude, but that is too tedious for seamen, since it requireth the deep knowledge of astronomy, wherefore I would not have any man think that the longitude is to be found at sea by any instrument; so let no seamen trouble themselves with any such rule, but (according to their accustomed manner) let them keep a perfect account and reckoning of the way of their ship.—DAVIS, *The Seamen's Guide* (1594).

IN THESE days of widespread training in the art of navigation, many of our citizens have come into close contact for the first time with the marine chronometer. Heretofore they probably knew of it only as a very accurate kind of clock, and that the watchmaker kept one in his show-window for the convenience of the passer-by. Even after they learn to use the instrument, moreover, it is probable that most accept its marvelous accuracy as a matter of course, and little realize perhaps that this modest-appearing mechanism is the very keystone of modern navigation, and that its advent was the answer to a mighty problem that had baffled the world for centuries.

THE PROBLEM OF LONGITUDE

This mighty problem was nothing more than the discovery of any practical method of finding the longitude at sea—a very simple and accurate operation nowadays. It had not existed in the early days when mariners remained always in sight of land and rarely essayed the open sea. But when they finally ventured past the Pillars of Hercules and out into the terrifying immensity of the Western Ocean, then the problems of navigation really began. As the great explorers began to extend the horizons of the known world, and close on their heels came the expanding commerce of their countries, this lack in the science of navigation became woefully apparent.

Of all the maritime nations there was none more deeply concerned than Great Britain. Her ships and lusty mariners were spreading out from their island kingdom, over the seven seas, but the appalling losses of ships clearly indicated a grievous lack in their navigation. Hence, in 1714, when Queen Anne was on the throne, a petition was presented to Parliament

* Reprinted (in part) through the courtesy of the U. S. Naval Institute Proceedings, February 1944.

by "several captains of Her Majesty's ships, merchants in London, and commanders of merchantmen, in behalf of themselves and all others concerned in the navigation of Great Britain," stating the pressing need of some accurate means of determining longitude and begging that Parliament assist in the matter. In answer Parliament set up a "Board of Commissioners for the Discovery of Longitude at Sea." The Board set up a list of magnificent prizes for anybody who could furnish a solution meeting certain conditions; £20,000 to anybody who could bring forth a practical method of finding the correct longitude at sea within 30 miles; £15,000 for within 40 miles, and £10,000 for within 60 miles.

The tender of these magnificent prizes brought forth ideas by the hundreds, some of which were well thought-out and sensible, and others which reached depths of silliness and heights of fantasy. Probably none reached the heights achieved in the solution solemnly proposed by an English cleric. In England at that time there was a peculiar belief regarding the bandages used on wounds. It was believed that if any of these bandages should be removed and reduced to powder, the dropping of a pinch of this powder into water at any time would cause the wounded person to experience a sharp stab of pain in his wound, at that same instant and no matter how far away he might be. This was known as "The Powder of Sympathy," and the earnest divine proposed to utilize its properties by wounding and duly bandaging a number of dogs. Every outbound ship could take one of the wounded dogs, while powdered bandages from the animal would be kept at a reference point on shore. Then at the instant of noon each day at this reference point, a pinch of the powder would be dropped into a basin of water, the poor dog many leagues at sea would simultaneously emit a loud yelp, and there you had your time-comparison and solution of the longitude problem.

Many of the more intelligent people were on the right track, as their suggestions involved simultaneous comparison of the time at the ship and the time at the reference-meridian. This was all right as far as it went, but the rub was—how to effect this time-comparison.

Longitude by Lunar Distances

An earnest searcher had decided that in the moon's rapid progress across the skies, against a background of seemingly fixed stars, there might be constituted a gigantic clock, and that this clock would provide a means of simultaneous time-comparison and hence of determining longitude. This was the birth of the idea of "Lunar Intervals" or "Lunar Distances," later to be commonly known as "Lunars."

Making this idea into a practical method was a herculean task, and it was to absorb the efforts of scientists for almost 300 years as they strove

to make it workable. Basically the theory was simple enough. As the moon moves across its background of stars, the apparent angular distances between the moon and prominent stars, as viewed from the earth, will change considerably in the space of every two- or three-hour period. Now these apparent angular distances might be predicted and tabulated for a year ahead, based upon dates and time-intervals at a reference-meridian. A navigator at sea then could observe the angle between the moon and a certain star, could derive from the tables and some calculations the corresponding time at the reference-meridian, and by comparison with the local time could then determine his longitude.

The theory thus was simple, but its application was something else. In the first place, there was little, if any, recorded knowledge of the moon's irregular movement, and years of painstaking observation would be necessary before its position for a year ahead could be predicted with the slightest accuracy. Then there was the long and complicated mathematical procedure involved, which undoubtedly was beyond the capacity of most of our early mariners.

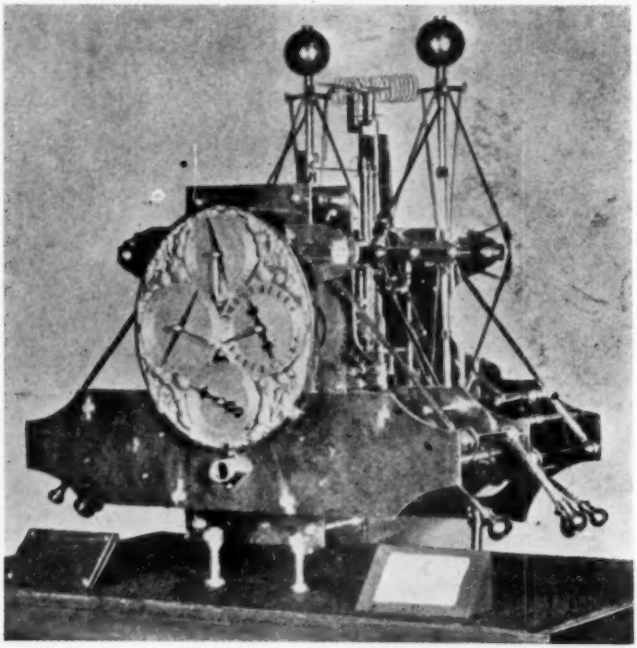
While some of the scientists went about the preparation of lunar tables, others cast about for a more practical method. As one idea after another was found wanting, the method of lunar distances seemed to hold the only possible answer, and in 1675 Charles II founded the now-great Greenwich Observatory solely for the purpose of preparing the requisite tables.

Harrison's First Seagoing Clock

At this point enters the hero, a humble, poorly educated watchmaker. He was one John Harrison of Yorkshire, son of a country carpenter, who had started his career as a carpenter also, and then had learned the trade of watchmaking. Moved undoubtedly by the huge rewards held forth, he undertook to make a seagoing clock that might furnish the answer. Obviously weights and pendulum would be of no use at sea, so he employed a spring for driving the mechanism, and a spring balance and escapement for regulating its movement. To compensate for temperature variation he made the balance springs of brass and steel riveted together, and to prevent the irregularity that a tossing ship would engender he employed a system of four counteracting spring balances. With these and some other devices and refinements, he believed that he had the answer, so he laid his clock before the Board in 1736.

The clock was a bulky affair in a rectangular wooden case, the whole weighing almost 65 pounds. Even some of the gear wheels and bearings were of wood. The Board accepted it for test and placed it on board H.M.S. *Centurion* for a voyage to Lisbon and return. On the voyage the clock gave a demonstration that impressed even the most skeptical, and

upon return to England its entire accumulated error would have allowed a possible discrepancy of hardly more than 18 miles in longitude. It seemed unquestionable that the great longitude problem had been solved at last, and with results far beyond the Board's requirements. But nevertheless John Harrison was not to get very promptly or easily the prize he so honestly had won. Moved by several influences, some of them not very praiseworthy, the Commissioners doled him out only £500 and urged him to continue his efforts.



COURTESY NATIONAL MARITIME MUSEUM

HARRISON'S NO. 1 TIMEKEEPER

There were some powerful influences working against the lowly watchmaker, and foremost among them was a determined and highly placed band of advocates of the lunar method. This group refused to admit the obvious shortcomings and dubious prospects of the lunar method, in contrast with the demonstrated success of the clock, and they opposed the adoption of

clocks with almost fanatical zeal. Thus, with the advent of this seagoing clock, from which our modern marine chronometer has evolved, there was launched a historic controversy, outstanding in its bitterness and duration.

John Harrison and his friends had no powerful backing, and he had no course but to prove his case beyond any possible doubt. In 1749 he finished a second clock, much smaller and with fewer gear wheels. In 1758 he finished another and even better clock, and then in 1761 he brought forth his most successful one, which was shaped like a pocket watch, and about 5 inches in diameter. His son took the clock to Jamaica and back in H.M.S. *Deptford*. On the voyage this clock gave such a convincing performance that certainly there should have been no further doubt that John Harrison had fully earned the promised reward.

The controversy which had raged during all these years, however, still went on unabated. The lunar advocates still refused to admit the success of the clock and they strove by every means to have their cherished method accepted. Their prime need for a better observing instrument had been filled in 1731 when Hadley invented his quadrant, but this solved only part of their problem, as the lunar tables were yet very far from adequate, and there always remained the method's inescapable faults.

Maskelyne—Astronomer-Royal

Here enters what might be called the villain of the drama, the most prominent figure among the lunar advocates, and the bellwether of the devoted flock. He was Dr. Nevil Maskelyne, and his very name seems to fit the part, as John Harrison's does the hero's. He was one of the greatest scientists of his time, and his intellectual achievements have given him a deservedly high place in the history of science. But in the matter of determining longitude there must have been a "dark sector" in that otherwise brilliant mind, and he set his face against the use of clocks with stubborn and lasting firmness. He fervently espoused the cause of the lunar method, and with this bitterly opposed the humble watchmaker. In 1763 he brought forth *The British Mariner's Guide*, which dealt mainly with longitude by the lunar method. Then in 1765 he was appointed Astronomer-Royal, and with the power and prestige of this high office he was enabled to further his pet project, and at the same time he could, and did, make things difficult for the humble watchmaker. In 1766 he brought forth the first *Nautical Almanac*, which also was largely devoted to "lunars," and purported to show the superiority of the method. The manifold assumptions, allowances, corrections, and intricate calculations necessary in his procedure—all without the slightest assurance of any accuracy in the result—would appall any modern navigator.

John Harrison, now over 70, was seriously handicapped in his struggle

by the fact that his lack of early education made it very difficult for him to express his ideas in writing. But by now he was not alone in his unequal battle. Accurate seagoing clocks were being built by other watchmakers, both in England and in France, and they all joined forces against the lunar advocates. However, the latter still had every advantage of place and power, and their influence was only too evident in the course of the battle. For in 1763, 27 years after John Harrison had first demonstrated his unquestionable right to the £20,000 prize, the Board grudgingly paid him only one-half of the amount, and refused to give him the rest.

John Harrison was a weary old man worn by a lifetime of hard work and the years of bitter controversy, when in 1775 he was given the remainder of his fairly earned reward. That next year he died, at the age of 83, satisfied perhaps that his success was at last acknowledged, but passing too soon to witness the complete triumph of his handiwork. For as the eighteenth century drew on to its close, the use of the seagoing clocks spread rapidly. The name "chronometer" was born, to become a lasting symbol of timekeeping accuracy, and the art of navigation became something more than the crude approximations of former times.

The lunar advocates refused to admit defeat, however, and the nineteenth century found them gathered about their tattered banner, still in considerable force and shouting defiance. Dr. Maskelyne stuck to his guns until he died in 1811, and almost with his last breath he stated that he still preferred "the lunar method to any clock." Though fairly adequate tables were now available, few if any navigators except those of scientific bent would attempt the method.

As the nineteenth century progressed, the art of navigation steadily improved. The lunar method still was in the textbooks and almanacs but the practical navigator gave it little attention, and it became a matter of hardly more than academic interest as the years went on. But it still had its devoted advocates and they continued to voice their faith in the superiority of their beloved "lunars."

The twentieth century opened and found "lunars" still in the textbooks and almanacs, but not many years afterward they disappeared altogether from the pages, never to reappear. Yet as late as 1905 there were in England a few last and vociferous survivors of the devoted band. Then even these passed on into silence; there came a generation of navigators who had never known it either in theory or in practice, and the method of "Lunar Distances" faded at last into history.

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"I wonder what Latitude and Longitude I have got to!" (Alice had no idea what Latitude was, or Longitude either, but she thought they were nice grand words to say.)

—*From Alice in Wonderland.*

Training African Surveyors in Nigeria*

O. E. EVO, GOVERNMENT SURVEYOR, Nigeria

WHENEVER the Government wants to receive new students to be trained as surveyors for the Government Service it is usual for the public to be informed by means of a *Gazette* Notice outlining the conditions of entry into the Survey School which is attached to the Land and Survey Department. Nowadays students are admitted through the Government Higher College at Yaba by means of the Entrance Examination of that college. It is one of the conditions that before a candidate applies to take this Entrance Examination he must have passed his Cambridge School Certificate Examination, the Matriculation Examination of any British University, or its local equivalent, and must possess also a certificate of character.

The subjects at this Entrance Examination vary with the profession for which a candidate intends to enter, and, as we are dealing with the training of surveyors, it is best to deal with the subjects an intending surveyor is required to take. These subjects are: (1) Physics; (2) Mathematics; (3) English; (4) Latin or French; (5) Chemistry; (6) Biology; (7) History; and (8) Geography.

Subjects (1) to (3) are compulsory and a candidate entering the Survey Course will have to take these and another two, making five subjects in all. If he secures a sufficiently high place in this examination he may be awarded a Government scholarship of £50 per annum to study surveying. Those who do not pass sufficiently well become paying students.

THE HIGHER COLLEGE

Before a candidate enters the college he is first examined medically by a Government Medical Officer to make certain that he is fit for the Government Service. He is then admitted into the Higher College where he has to do some science and mathematics and theory of surveying for 2 years. The subjects in which he receives lectures at the college comprise the following:—

(1) Advanced Mathematics—Algebra, Analytical Geometry, Spherical and Plane Trigonometry, Mensuration, Differential and Integral Calculus.
(2) Physics—Mechanics, Heat, Light, Sound, Statics, Electricity and Magnetism.
(3) Inorganic Chemistry.
(4) Workshop Course—Woodwork and Metal Work.

* Reprinted through the courtesy of Empire Survey Review, April 1944.

(5) Mechanical Drawing—Simple Designs, etc.
(6) History.
(7) Geography.
(8) English.

The Survey School

These subjects are usually taken in the first 2 years of the training at the Higher College itself. At the end of this period candidates sit for an examination, and, on passing, they then proceed to the Survey School for another 2 years for a comprehensive course in the Theory and Practice of Land Surveying and Geodesy which is made up of the following subjects:—

Theory

(1) Compass and Chain Surveying.
(2) Leveling by theodolite or level.
(3) Cuttings and Embankments.
(4) Angle measuring instruments.
(5) Tacheometric Surveying.
(6) Curve Ranging for roads and railways.
(7) Field Astronomy and Computations.
(8) Errors in Observations and their adjustment.
(9) Projections—the transverse Mercator.
(10) Clarke's formulae for the determination of geographic position and other routine survey computations.
(11) Traverse surveys, including reduction of measured lines for sag, slope, temperature, sea level, standard and scale correction.
(12) Determination of heights.
(13) Topographic Surveying with compass, rope, and sound traverse, and barometric heights.
(14) Topographic Plane Tabling with range finder, clinometer, and telescopic alidades.
(15) Contouring.
(16) Computation of areas by the Method of Double Longitudes, and such figures as have irregular or curvilinear boundaries. Sub-divisions and cutting off given areas.
(17) Knowledge of (a) The Survey Ordinance and Regulations, (b) The Mineral Ordinance and Regulations in so far as it relates to survey.

Field Work

(a) Survey of an area by closed theodolite traverse, including connection to triangulation; observation for latitude, time and azimuth; simple Topographic Surveying; traverse of an irregular boundary and re-establishing a lost beacon.

(b) Survey of a township area including boundary beacons, buildings, and natural features, if any.

(c) Leveling by instruments such as precise level, reversible and Dumpy levels, Indian clinometer, Abney level, and barometer.

(d) Lay-out of plots.

(e) Chain Survey and Compass Traverse.

(f) The adjustment of all survey instruments.

From the foregoing it will be seen that items (a) to (f) above comprise a course of practical surveying required of a surveyor before passing out of the Survey School. Thus it is that, when any person wants to qualify as a Licensed Surveyor in Nigeria, he has to cover much the same ground in the Surveyors' License Examination. Any surveyor who has passed through the Survey School course in the honors grade will not find the License Examination too difficult an examination for him.

Final and License Examinations

On successful completion of the Survey School course all students must submit themselves to the Final Examination. For a pass it is usually required that a candidate must obtain an average of 60 percent aggregate, or more, with a minimum of 50 percent in each subject, before he is considered as having satisfied the examiners. The examination usually consists of papers in Survey Regulations, English, Mathematics, Astronomy, Survey Computations, Theory of Surveying, and Practical Surveying including Plan Drawing.

The successful candidates are sent out with field parties for practical experience before they are confirmed in their appointments as professional surveyors in the Land and Survey Department of Nigeria. They can, if they so desire, take their License Examination after they have been confirmed in their appointments in the Civil Service. Whatever an applicant's academic qualification, he must submit to this examination in Nigeria before he is allowed to practice surveying unless he has the equivalent to the Surveyors' License Examination.

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A MATTER OF LOCALE

THE MEANING *of instrument-man* in Jamaica differs from the meaning of the same word in most other places. There, an instrument-man is the man who carries the theodolite between stations—not the man who reads the angles.

Reinforced Concrete Piling Bench Marks in New Orleans

EUGENE N. BOWLING *

ALL bench marks in the City of New Orleans have been affected by the lowering of the water table due to improved sub-drainage, as is evident by the results of leveling in recent years by various city and federal organizations. This leveling data does not reveal any bench marks that may be considered stable. Data for the first contour map of the City of New Orleans were made in 1893, and elevations at the present time show that the surface of the ground over the entire area has changed materially. As is well known, New Orleans is built upon what was once a cypress swamp. In many locations in excavating for building foundations, layers of growths of cypress have been found.

At a meeting of engineers in New Orleans, Louisiana, in January 1938, during a discussion of bench marks and datum planes, a suggestion was offered that a new survey should be undertaken to establish a system of levels on a sea level datum, to which existing surveys could be tied and all elevations reduced to a common datum.

In order to definitely preserve this datum plane, it was decided that several groups of concrete piling bench marks, surmounted with standard man-hole frames and covers, should be established in New Orleans and vicinity. The important feature of this work would be the selection of sites where the piles could be driven with the least risk of future disturbance. Five individual sites were selected, such as school grounds, parks, etc., which were near or on the natural ridges within the city limits—the Metairie and Gentilly Ridges.

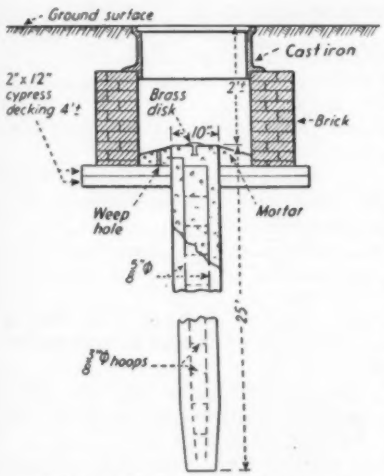
The use of piling driven many feet below the water table would prevent the settling of a bench mark with respect to the ground itself; and otherwise, the bench marks are not readily disturbed, as is the case with unsupported ones. This type of mark is considered advisable in a city where bench marks are dependable in only a limited section.

Through the cooperation of the United States Engineers, First and Second New Orleans Districts, and the New Orleans Sewerage and Water Board, the establishment of these piling bench marks was decided on. These organizations undertook the construction, and the carrying of levels was soon to follow.

The United States Coast and Geodetic Survey—for more than a half

* Senior Engineer, U. S. Engineer Office, Miami, Florida. Disrict.

century—has been establishing precise first-order levels throughout the United States, and the joint cooperation of the above mentioned organizations enabled the employment of the Survey to do the necessary leveling to include the new type of marks as well as marks established many years past.



Reinforced concrete pile bench mark.

A line of first-order levels—from Biloxi, Mississippi to Baton Rouge, Louisiana (via New Orleans)—was also decided upon; Biloxi and Baton Rouge being the locations of the automatic tide gage and high stable ground, respectively.

The illustration shows the type of man-hole frame and cover adopted. The man-hole is of brick masonry covered by a 24-inch cast iron frame and cover which bears the letters "B. M." The frame is designed to prevent the heaving or separation of the foundation material or pavement, as the case may be, from the frame. This feature is a recessed section around the circumference of the frame into which the foundation material can pack and thus lock the frame completely with the balance of the frame.

The illustration also shows the type of precast concrete pile adopted. A special wooden cap was used while driving to prevent the shattering of the head of the pile. Every effort was made to preserve the heads of these piles because into the recessed heads were to be cemented properly inscribed bronze disks serving as the bench marks.

These seemingly costly bench marks were established to afford the various city and federal engineering agencies throughout the locality, stable benches on a universal datum; thus eliminating the chaos which has resulted heretofore from a conglomerate system of unstable bench marks based on a variety of datums.

The final result should, therefore, settle for all time the constant and confused efforts to determine the differences in datum planes and elevations in the City of New Orleans.

Surveying and Mapping News

Members are requested to send in surveying and mapping news items for publication in SURVEYING AND MAPPING.—EDITOR.

CURRENT SURVEYING AND MAPPING LITERATURE

MAGAZINE ARTICLES

PHOTOGRAPHIC AVIATION. James G. Hall, *Photogrammetric Engineering*, March 1944. (Discusses types of units and equipment used by Army Air Forces in aerial photography for reconnaissance and for production of precise maps, aeronautical charts, target charts, and mosaics.)

PRECISION ALTIMETRY. Philip Kissam, *Photogrammetric Engineering*, March 1944. (Describes results of research carried on at Princeton University with high-grade altimeters designed for ground surveying.)

WHERE ARE WE? Kenneth I. Macleod, *The Nautical Magazine*, April 1944. (Describes improvised methods of obtaining position at sea developed while aboard a German prison ship.)

THE FUTURE OF MARITIME RADIO NAVIGATION. R. Baldwin, *The Nautical Magazine*, April 1944. (Outlines the steps necessary to improve radio navigation at sea.)

THE LIFEBOAT COMPASS AZIMUTH. *The Nautical Magazine*, April 1944. (Discusses the means of ascertaining the errors in lifeboat compasses by means of an approximate table of bearings of the sun rising and setting.)

POSTWAR SURVEY PROBLEMS IN NEW BRUNSWICK. (Canada.) K. B. Brown, *The Canadian Surveyor*, April 1944. (Discusses methods of land survey used in past and the value of aerial photographs for various survey purposes.)

TOPOGRAPHY ON A VERY SMALL SCALE. R. H. Field, *The Canadian Surveyor*, April 1944. (Land survey methods applied to determining errors of plane surfaces; methods used in Metrology Section, National Research Laboratories, Ottawa. Describes principle of collimators and application.)

CUTTING AND CLEARING LINE. W. B. Dingle, *The Canadian Surveyor*, April 1944. (Describes how bulldozer and schooner have replaced axes and tents in survey work in Canada.)

A LAND SURVEYORS USE OF EVIDENCE. E. Markham, *The Canadian Surveyor*, April 1944. (Deals with evidence used by the surveyor at work in the field, as distinguished from court evidence.)

THE USE OF AERIAL PHOTOGRAPHY IN HIGHWAY SURVEYING. W. J. Fulton, *The Canadian Surveyor*, April 1944. (Describes modern methods of highway location from interpretation of aerial photographs, as practiced in northern Ontario.)

THE EVOLUTION OF THE DIVIDING ENGINE. E. Wilfred Taylor, *Empire Survey Review*, April 1944. (Describes chronologically the various types of

machines developed for graduating circular instruments such as sextants and theodolites.)

CURVATURE AND REFRACTION TABLES FOR TOPOGRAPHICAL SURVEYS. N. B. Favell, *Empire Survey Review*, April 1944. (To be reprinted in a later issue of SURVEYING AND MAPPING.)

THE TRAINING OF AFRICAN SURVEYORS IN NIGERIA. O. E. Eyo, *Empire Survey Review*, April 1944. (Reprinted in this issue.)

APPROXIMATE METHODS OF SOLVING NORMAL EQUATIONS. A. N. Black, *Empire Survey Review*, April 1944.

CLAUDE REIGNIER CONDER AND THE SURVEY OF PALESTINE. Col. Sir C. F. Arden-Close, *Empire Survey Review*, April 1944. (An account of the history and method of the first comprehensive and systematic survey of the Holy Land (1871-1878) made under the auspices of the Committee of the Palestine Exploration Fund. Comparison with modern survey of Palestine.)

GENERAL PRECAUTIONS TO BE TAKEN IN DRAWING A MILITARY MAP. *The Military Review*, April 1944. (An extract from chapter 10 of *Applied Tactics*, a translation of a Japanese reference manual, revised 1938, on applied tactics adapted for use in the Japanese Military Academy.)

GEODETIC CONTROL SURVEYS AROUND LOS ANGELES. Alfred Jones, *Civil Engineering*, May 1944.

PLANE TABLE VERSUS TRANSIT FOR TOPOGRAPHIC MAPPING. M. F. Denault, *Engineering News-Record*, May 4, 1944. (Reprinted in this issue.)

ADJUSTING TRAVERSES. C. L. Garner, *Engineering News-Record*, May 4, 1944. (Discussion of article on "Adjusting Traverses on the Plane Grid System," which was listed in the April issue of the BULLETIN.)

TEACHING MAP READING EFFECTIVELY. Wentworth J. Tellington, *The Military Engineer*, June 1944. (Discusses elementary knowledge prerequisite to map reading and outlines a specific plan for developing the student map reader's ability.)

WOMAN POWER IN THE CORPS OF ENGINEERS. Victor V. Martin, *The Military Engineer*, June 1944. (The substitution of women for men in technical jobs, such as survey engineers, geologists, radio operators, draftsmen, and architects.)

IMPROVED SIGNAL LAMP DESIGNED FOR NIGHT SURVEYING. Douglas L. Parkhurst, *Engineering News-Record*, June 1, 1944. (Reprinted in this issue.)

WHERE INVASIONS ARE BORN. Jim Marshall, *Collier's*, June 10, 1944. (Discusses the importance of maps in invasion plans; specifically, the U. S. Coast and Geodetic Survey's part in the mapping program.)

THE GEOGRAPHIC'S NEW MAP OF GERMANY AND ITS APPROACHES, With a Review of the Society's Maps of Europe. Gilbert Grosvenor, *National Geographic Magazine*, July 1944.

BOOKS

ELEMENTS OF TOPOGRAPHIC DRAWING. Roscoe C. Sloane and John M. Montz. *McGraw-Hill*, New York. Second edition. 1943. 251 pages. $3.00. (Discusses conventional signs, topographic mapping, topographic drawing in colors, contours, copying-duplication-reproduction, map projections, and suggestions for office practice.)

AIR PHOTOGRAPHY APPLIED TO SURVEYING. Major C. A. Hart. *Longmans, Green and Company*, New York. 366 pages.
(Describes air photography as a method additional to existing methods of surveying.)

MAPS. Alexander D'Agapeyeff and E. C. R. Hadfield. *Oxford University Press.* 140 pages. $1.75.
(The fundamentals of topographic surveying and map projection are discussed in Part I; the history of maps in Part II.)

ENGINEERS' DICTIONARY (Spanish-English and English-Spanish). Louis A. Robb. *John Wiley and Sons, Inc.*, New York. 423 pages. $6.00.
(A compilation of English and Spanish equivalents in the vocabulary of the engineers of North, South, and Central America.)

ELEMENTARY TOPOGRAPHY AND MAP READING. Samuel L. Greitzer. *McGraw-Hill*, New York. 1944. 152 pages. 148 illustrations. $1.60.
(For secondary-school students—an elementary textbook based on a course in map reading given to a group of high school teachers.)

MAP INTERPRETATION WITH MILITARY APPLICATIONS. William C. Putman. *McGraw-Hill*, New York. 67 pages. 37 illustrations. $1.25.
(Explains the nature of terrain as represented on topographic maps and aerial photographs and the meaning of these landforms to the tactician.)

AEROPHOTOGRAPHY AND AEROSURVEYING. James W. Bagley. *McGraw-Hill*, New York. 324 pages. 137 illustrations. $3.50.
(A guide to taking, interpreting, and using aerial photographs for standard and exploratory maps, mosaics, and engineering surveys.)

BOOKS RECEIVED

DOWN TO EARTH: Mapping for Everybody. David Greenhood. *Holiday House*, New York. 1944. 262 pages. $4.00.
(To be reviewed in a later issue of SURVEYING AND MAPPING.)

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PHOTOGRAMMETRY SOCIETY MEETS

THE TENTH ANNUAL MEETING of the American Society of Photogrammetry was held at Washington, D. C., on January 21 and 22, 1944. The program included talks on the use of aerial photographs in the various theaters of war, the design of precise instrument making, and discussions on postwar opportunities for photogrammetric work. A number of interesting exhibits were displayed showing precise mapping projects and the development of photogrammetric equipment. General H. H. Arnold presented the Photogrammetric Award to Lieut. Colonel Gerald FitzGerald of the Army Air Forces for his outstanding work in tri-metrogon mapping. He told how the Army Air Forces "under pressure" photographed and

charted 500,000 square miles from the early spring of 1941 until the time of Pearl Harbor.

The following are the newly elected officers for 1944: President—Louis A. Woodward; First Vice President—O. M. Miller; Second Vice President—Commander R. S. Quackenbush; Secretary-Treasurer—Henry M. Townsend.

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BOLIVIA UNDERTAKES BIG MAPPING PROGRAM

A NEW MILITARY Geographic Institute, recently authorized by the Bolivia Chamber of Deputies, is expected to contribute greatly to the military and economic life of Bolivia by mapping, for the first time on a large scale, strategic zones and areas of productivity scattered throughout the republic.

As approved by the lower legislative chamber, the Institute would be administered and directed by the Bolivian Army. Consequently, one of its most important functions would lie in mapping areas of military importance and in giving Bolivia a detailed knowledge of its geography sufficient for any emergency, military or otherwise.

Specifically, the Military Geographic Institute is authorized to map the country in accordance with standards established by the International Geodetic and Geophysical Union; to control and supervise the publication of all maps of Bolivia issued by governmental or non-governmental agencies; to assist in fixing national, departmental, and provincial boundaries; and to fix the general triangulation of the country and collaborate with similar institutions elsewhere.—*Engineering News-Record*, December 30, 1943.

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POSTWAR HIGHWAY CONSTRUCTION

A PROGRAM developed by the American Road Builders Association indicates that highway construction after the war will be the largest ever undertaken in this Country.

One of the principal recommendations of the report is that construction totaling three billion dollars per year be undertaken for 5 or 6 years following the war. The previous record highway construction program, in 1930, ran close to one billion five hundred million dollars.—*Scientific American*, March 1944.

CONGRESS NEWS

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SECRETARY'S REPORT

(As Presented at Annual Meeting—June 3, 1944)

THE AFFAIRS of the Congress during the past year have been ably directed by our genial and energetic President in Chattanooga, and by the Executive Committee in Washington which held eight luncheon-meetings. Urgent war work and transportation difficulties have prevented the Regional Vice Presidents from holding meetings of the Board of Direction.

Various members of the Congress participated in the Consultation on Cartography held in Washington during the latter part of September and the early part of October between representative cartographers from the South American nations (excepting Argentina) and from Mexico, Canada, and the United States. Several hundred persons attended the public meeting in the Department of Interior Auditorium on the evening of October 6 in honor of the visiting experts. The January 1944 BULLETIN carried a full report of the meetings.

The BULLETIN of the Congress, in the hands of Mr. A. L. Shalowitz, Editor, has improved during the past year in size and content. To render Mr. Shalowitz much needed assistance in securing material for publication, the Executive Committee was fortunate recently in prevailing upon Commander Frank S. Borden, U. S. Coast and Geodetic Survey, to organize a Publications Committee.

The color film, "Cartographic Activities in the United States," has been made available through the Regional Vice Presidents for exhibition before engineering societies, student groups, and business organizations. It has been on two tours to the Pacific Coast and is now being shown in the western states.

There has been little activity in the Technical Divisions of the Congress due to the war conditions. It is to be noted that Mr. S. A. Bauer of Cleveland, has conducted a canvass of the membership to determine whether a Division of Private Practitioners, or Land Surveyors, would receive enough support to warrant its organization. More than seventy members have expressed an interest.

While no concerted effort has been made to increase our membership, we are, nevertheless, adding new members to the Congress all the time. We have to date approximately 550 members. I say *approximately* because

many of our members have gone overseas, and we have lost contact with them. Since membership is our only means of revenue, it is important that the membership be materially increased if we are to continue publishing a Bulletin of the caliber of the last two issues. We have been helped considerably by the enrollment of several Institutional Members. These, and other new members, are listed in the Bulletins.

Respectfully submitted,

RICHARD T. EVANS,
Acting Executive Secretary.

FINANCIAL STATEMENT

(As of June 30, 1944)

Balance on hand (July 1, 1943)		$ 954.13
Receipts		
Memberships (Commercial)	$ 275.00	
Memberships (Libraries)	15.00	
Memberships (Individual)	1,758.09	
Reimbursement	3.86	
Fourth Annual Meeting	146.00	2,197.95
Total to be accounted for		$3,152.08
Expenditures		
Unpaid obligations (Third Annual Meeting)	$ 101.20	
Printing	1,410.32	
Mailing service	356.00	
Office supplies	121.10	
Stenographic service	122.92	
Banking service	5.54	
Post Office box rent	12.00	
Fourth Annual Meeting	376.35	
Total expenditures		$2,505.43
Balance on hand (June 30, 1944)		$ 646.65

Respectfully submitted,

RICHARD T. EVANS,
Treasurer.

DIVISION ON PROPERTY SURVEYS ORGANIZED

A FEW MONTHS AGO, Mr. S. A. Bauer, engineer and surveyor of Cleveland, Ohio, was requested by the Executive Committee to conduct a poll of the membership regarding the desirability of organizing a technical division on property surveys. The poll revealed that a substantial number of members were interested. Mr. Bauer submitted a comprehensive and interesting report on the results of the poll, copies of which were distributed to all officers of the Congress. Considerable and very interesting discussions developed regarding a suitable name for the proposed division. The choice seemed to lie among three names: (1) land surveys; (2) private practice surveys; and (3) property (or property line) surveys.

At the annual meeting on June 3, Mr. Bauer briefly recounted the activities so far, and during ensuing discussion gave the opinion that in spite of present unsettled conditions, now would be a good time to set up such a technical division. A resolution was then presented and unanimously adopted, as follows:

RESOLUTION

WHEREAS the property surveyor is the contact through whom the public knows the science of surveying and mapping, and

WHEREAS there exists at this time no organization of national scope which deals particularly with the problems of the property surveyor, and

WHEREAS a strong organization of property surveyors is necessary for the ultimate use and appreciation of all surveying and mapping efforts;—

THEREFORE, BE IT RESOLVED that a Technical Division on Property Surveys be established within the American Congress on Surveying and Mapping, for the purpose of (1) developing standards of survey practices in property surveys, (2) establishing a medium for the interchange of ideas, and (3) for prosecuting such other activities as are incident thereto and logically a part thereof.

Later the Executive Committee appointed Mr. Bauer chairman of the Property Surveys Division, he to function as such until the Division is completely organized and can elect officers in the prescribed manner. Other officers will be appointed by Mr. Bauer, subject to approval by the Executive Committee, until such time as an election may be held.

It has been suggested that the Division should include in its activities, in addition to those listed in the resolution, the following:

1. Procure and maintain a list of all regional, state, and local surveyors' organizations.

2. Procure and maintain complete lists of all registered surveyors in each state having license laws.

3. Compile a list of state license laws, with copies of each law, and prepare a comparative study of them, with results shown in tabular form, suitable for publication in SURVEYING AND MAPPING.

4. Obtain information as to the status and practices of property surveys in other nations, with particular reference to training, licensing, compensation, degree of government operation or control, accuracy standards, methods, instruments and other equipment, and ethics.

These and other matters to be handled by the Division are of great importance to all interested in surveying and mapping, whether or not engaged directly in property surveys. The results, therefore, will be published in SURVEYING AND MAPPING from time to time for the information of the membership.

GEORGE D. WHITMORE, *President.*

COLONEL HARDING RECEIVES FRENCH AWARD

MEMBERS of the American Congress on Surveying and Mapping will be interested to learn that Lieut. Colonel George H. Harding, the first Executive Secretary of the Congress and a leading personality in its organization, was recently awarded the badge of the French Service Geographique for technical assistance to a French engineering group in Syria and Lebanon.

Colonel Harding has been stationed in Egypt for 20 months with the Corps of Engineers.

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MAPS

"But thou at home, blest with securest ease,
Sitt'st, and beleev'st that there be seas,
And watrie dangers; while thy whiter hap,
But sees these things within thy Map.
And viewing them with a more safe survey,
Mak'st easie Feare unto thee say,
A heart thrice wall'd with Oke, and Brasse, that man
Had, first, durst plow the Ocean.
But thou at home without or tyde or gale,
Canst in thy Map securely saile:
Seeing those painted Countries; and so guesse
By those fine Shades, their Substances:
And from thy Compasse taking small advice,
Buy'st Travell at the lowest price."

—Robert Herrick in "A Country Life."

NEW MEMBERS

ASHER, JACK
Engr. Draftsman, Basic Magnesium Inc.,
209 Beckley Bldg., Las Vegas, Nev.

BURRITT, EDWIN W.
Civil Engineer,
901 20th St., N. W., Wash., D. C.

CLARY, ERNEST H.
Chief Civil Engr., Basic Magnesium
Inc., Box 1150, Henderson, Nevada

DUNICH, JOSEPH P.
Associate Cartographic Engineer,
U. S. Coast & Geodetic Survey, N. Y.

FINNEGAN, HENRY E.
Lt. Comdr., Ch. Nautical Chart Br.,
U. S. Coast & Geodetic Survey

FLACH, VICTOR H.
Senior Topographic Engineer,
U. S. Forest Service, Wash., D. C.

GENEST, MARCEL E.
Land Surveyor, Department of
Lands and Forests, Quebec, Canada

KRAUSE, ROBERT H.
Civil Engineer and Surveyor,
1926 E. 79th St., #2, Cleveland

LANDER, WILLIAM P.
Engr. and Surv., The Lander Engr. Co.,
3721 Winchell Rd., Cleveland, Ohio

LE GEAR, (MRS.) CLARA E.
Asst. Chief, Division of Maps,
Library of Congress, Wash., D. C.

LIEBERMAN, HARRY A.
Lieut., U. S. Army, Mapping Branch,
Engineer Board, Fort Belvoir, Va.

LIST, EMIL J.
Principal Engineering Draftsman,
U. S. Coast & Geodetic Survey, N. Y.

LEWANDORF, S. C.
Chief Engr., The Cleveland Surveys,
991 Old Arcade, Cleveland, Ohio

McCAMMON, ROBERT L.
Associate Topographic Engineer,
U. S. Geological Survey, Wash., D. C.

MEDINA, GUILLERMO
Head Engr., Hydrographic Office,
Navy Department, Suitland, Md.

MEDINA, MANUEL
Ing. Div. "B", Oficina de Geografia,
Ave. Observatorio 192, Mexico City

MEYER, WILLIAM H., JR.
Vice President Aero Service Corp.,
34 Webster Ave., Manhasset, L. I.

NELSON, OSCAR H.
Sr. Cartog. Engr., Ch. Cartog. Sect.,
U. S. Geological Survey, Wash., D. C.

OBER, CHESTER HOWARD
New York Mgr., "The Iron Age,"
100 East 42nd St., New York

PATTERSON, JAMES A.
Sr. Technician, Pennsylvania State
Planning Board, Harrisburg, Pa.

PERLMUTTER, JEROME H.
Cartog. Engineering Draftsman,
Navy Department, Washington, D. C.

PRESSLY, H. GILBERT
Field Engr., Magnolia Petroleum Co.,
Box 900, Dallas, Texas

ROGERS, LEROY
Asst. Civil Engr., Tenn. Valley Auth.,
1701 Golf St., Chattanooga, Tenn.

VELASCO, ALVARO
Mayor, Institute Geografica Militar,
Bogota, Colombia

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To the Board of Direction:

I hereby apply for membership in the AMERICAN CONGRESS ON SURVEYING AND MAPPING and agree, if this application is accepted by the Committee on Admissions, to be governed by the Constitution, By-laws, and Rules of the Congress while holding membership.

_____
(Signature)

●

PERSONAL INFORMATION
(Please typewrite or print)

Name.....
(With desired title of address)

Occupation (with title of position or rank).....

☐ Business address .....

☐ Home address.....
(Indicate by check where Congress communications are to be sent)

City and State.....

State education above high school. Name institutions and give degrees, year, and special training in surveying:

State what practical experience in surveying and mapping you have had:

Please give two references (not necessarily members of the Congress).

Name Address

(1).....

(2).....

●

Annual dues of $4.00 are payable on notification of acceptance and entitle members to all privileges of the Congress and to all its publications.

Mail application to Acting Executive Secretary

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Fill in application blank on page opposite and mail to the Executive Secretary.

Every member should enroll at least one new member.